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TONNAGE, PAST AND PRESENT.

IX.

THE application of the term *tonnage*, forming the subject of this paper, is the measure of the roomage for cargo in a ship or part of a ship, expressed in terms of a unit, called the *freight ton* of forty cubic feet. The French *tonneau de mer*, referred to in a former paper as being the unit of measurement in France for over a hundred and twenty years, consisted of forty-two cubic feet; and it has been thought that the freight ton originated in the *tonneau de mer*; but this is doubtful, inasmuch as the old French foot, or *pied de roi*, being equal to 12·789 English inches, the French *tonneau de mer* of forty-two French cubic feet would be equal to fifty-one English cubic feet. It may be that the divisor forty originated in the fact that articles of commerce, the limit to whose carriage depended upon space available, would all occupy at least forty cubic feet to the ton. Generally, then, when a *freight ton*, or a ton of measurement goods is spoken of, forty cubic feet is meant; but in vessels loading in India, the freight ton is fifty cubic feet of space.

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However it originated, the *freight ton* has proved itself of practical utility as a measure of space occupied as distinguished from dead weight carried. In the case of heavy goods, such as metals and ores, occupying but a small space in the hold, it is obviously the fairest thing to charge freight upon actual weight, while in the case of cargo, which fills up the available space in the ship, it is equally obvious that space and not weight affords the fairest basis for the charge of transport.

Gross register tonnage is also, as we have seen, a measure of space, but of the total internal volume of the ship, and it would appear at first sight as if it would afford a means of ascertaining the amount of cargo measured by space occupied. In the case of sailing-ships, Moorsom proposed an approximate rule for ascertaining the latter in terms of the former, as follows :—

"To ascertain approximately for an average length of voyage the measurement cargo at forty feet to the ton which a ship can carry, it is only necessary to multiply the number of register tons contained under her tonnage deck, as shown separately in the certificate of registry, by the factor $1\frac{7}{8}$, and the product will be the approximate measurement cargo.

In a paper read before the Institution of Naval Architects in 1860, Moorsom thus explained the origin of his factor * :—

"As regards $1\frac{7}{8}$, the factor for measurement cargoes, it is the opinion of experienced shipowners, and others practically acquainted with the stowage of ships, that the breakage of stowage occasioned by the obstruction of and space taken up by, the usual number of beams, knees, sleepers, &c., added to the necessary equipment of provisions, water, stores and dunnage for stowage, for an average length of voyage, may be estimated at 25 cubic feet out of every hundred of a ship's capacity; so that there will remain on an average only 75 cubic feet instead of 100 in every register ton available for the purposes of cargo; consequently if we divide 75 by 40, it gives $1\frac{7}{8}$ for the number of measurement tons contained in a register ton; or, in other words, if the register tons in the hold of a ship are multiplied by $1\frac{7}{8}$, we arrive at the

* "Transactions Institution of Naval Architects." Vol. I., page 134.

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number of measurement tons which she can, on an average of voyages, carry therein."

In the iron or steel sailing-ship of the present day, this ratio would be considerably exceeded, the stringers, beams, &c., would take up much less space than the obstructions in a wooden ship, and the stores carried would also generally occupy a less proportion of the hold. In a steamer there are other elements in the question which preclude any general ratio being used for a reasonably accurate determination of the capacity of the holds in freight tons derived from the gross tonnage of the ship. The latter includes the entire cubic content of the internal volume of the ship under the tonnage deck with the addition of the content of all closed-in spaces available for cargo, stores, or for the berthing and accommodation of passengers and crews. To ascertain from this the portion available for measurement as cargo space, we should have to deduct in the first place that part of the volume of the ship between the bounding bulkheads of the engine and boiler spaces, that is, the engine and boiler rooms with the side coal bunkers. This depends upon the character and size of the machinery, and bears no certain relation to the size of the ship. There are further, the contents of the fore and after peaks and the shaft trunk, &c., which are also varying quantities.

It is the general rule in the present day for a profile drawing of a steamer to be furnished by the builder to the owner, showing the bulkheads of the vessel and the appropriation of the spaces between them. The contents of the several holds and 'tween-deck spaces used for cargo are shown either in cubic feet or in freight tons of 40 cubic feet each. Each separate compartment is measured and its content ascertained by the draughtsmen from the drawings of the ship, either by making use of the rules for obtaining the content of curved bodies described in the earlier papers * of this series or by means of the planimeter already referred to.

The question often arises in practice, What do these contents in cubic feet really mean? The various portions of a ship's hold in which cargo is stowed are of varying utility, according to the nature

* *Nautical Magazine*, March, 1889.

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of the cargo carried. In stowing some cargoes, for instance, no use whatever can be made of spaces between the beams, and in some the obstruction caused by projecting stringers and by hold beams is a serious disadvantage, while in others the loss due to this cause is little more than the actual cubic content of the stringer or beam. On this question, as well as on others connected with this subject, much information is contained in a valuable paper, entitled, "The Stowage of Steamships," read before the Institution of Naval Architects, by Mr. F. P. Purvis, of Glasgow, in 1885. Supposing, then, that in each case to begin with, the hold is measured to the inboard surface of the batten or spar ceiling at the sides, and of the close ceiling below, which usually extends to the turn of the bilge. In the first place, what is the upper boundary of the volume measured? In the second place, on what principle are deductions made for obstructions such as keelsons, stringers, &c. In the case of larger obstructions, such as the shaft trunk, chain locker, fresh-water tanks, &c., there can be little question that their cubic content should be deducted from that of the hold. Regarding the other matters, Mr. Purvis took the pains to enquire, in detail, into the practice of twenty firms of shipbuilders, and thus analyses the information obtained from them :—

"Six firms out of the twenty include the beam space in their measurements, taking ordinates for measurement of holds ranging between the top of the ceiling and a height one-third of round of beam, down from the top of the beam. Ten others exclude the beam spaces, taking ordinates ranging between the top of the ceiling and a height one-third of round of beam, down from the under-side of beam at centre line of ship. Two of the ten firms do not set off the one-third round of beam down from under-side, in fixing the highest ordinate for area, but work simply to the under-side of beam at centre line of ship; while one takes the highest ordinate at the under-side of beams, half-way between centre and side, which is equivalent to taking it at one-fourth the round of beam, from under-side of beam at centre line of ship. One firm includes rather more than half the beam-space by taking the highest ordinate at half the depth of the beam. Another firm includes the spaces between the beams, but makes a deduction for the space

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occupied by each beam of a quantity measured by the depth of the beam, and a fore-and-aft measurement equal to the depth of the beam. Three firms measure both inclusively and exclusively, according as grain, tea, &c., are carried, on the one hand, or cargoes that will not be stowed between the beams on the other." Other similar divergences occur in the practice of measurements of 'tween-deck spaces. Mr. Purvis, after describing these at some length, goes on to say :—" Besides differing in the inclusion or exclusion of the beam-spaces, the twenty firms differ also in the value of deductions they allow for keelsons, deep-plate frames, stringers, masts, pillars and ventilators. The usual deduction for the three former when the structure is of the plate and angle iron type, is a rectangle bounding the projecting portion of the structure, but in several cases this is not done. When the projecting portion is a bulb-plate or the flange of an angle iron, there is in the majority of cases no deduction at all, but some firms allow a triangular piece to cover the projection. For round structures, sometimes the actual space occupied is alone deducted; at others the area of the space is measured by the square circumscribing the circle. Pillars are sometimes allowed for, sometimes not."

Besides these we may mention that a very common practice in some districts is to measure the content of the hold from lower surface of deck to in-board surface of ceiling and sparring, making no deduction whatever for beams, &c.; but of course measuring and deducting content of chain locker, fresh-water tanks, and other large obstructions. In one district it has been the practice with some firms to do this, and even to make an addition for the spaces between the frames behind the spar ceiling, on the ground that when grain is carried without lining such spaces are occupied by it. It is evident then that to secure uniformity in statements of the spaces in holds available for cargo some recognised system is needed. By no system whatever can just allowances be made for broken stowage caused by obstructions because the importance of it varies with the kind of cargo. It would appear then that the best system would be one which aimed at giving the exact cubic content of the hold, leaving the question of loss by broken stowage to be considered separately. If the cubic content of the volume bounded by the under side of

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deck and the in-board surface of the ceiling and sparring were measured in a fairly accurate manner, and deductions made of the actual cubic content of all beams, stringers, masts, &c., a good basis would be furnished for ascertaining the quantity of cargo carried. As regards the importance of minor obstructions, it may be mentioned that in a cargo steamer in which the beams, stringers, pillars, keelsons, pump casings, masts, &c., were measured in detail in the various holds and 'tween-deck spaces used for cargo it was found that the actual cubic content of the obstructions varied from ·0041 to ·0063 of the total space, the mean being ·0054, or a little over one-half per cent. This is of no great importance, and it would be sufficient to estimate it rather than go into small details.

It is evidently desirable either to have some uniform generally recognised system of stating contents of holds, or else on each such statement to clearly set forth what is and what is not included.

Connected with the question of the tonnage of vessels for freight and stowage is the further consideration of the stowage rate of various materials. The great authority on these matters is the very valuable work, "Stevens on Stowage," which contains a mass of information on this and many other matters of importance to shipowners and shipmasters, but is somewhat defective in arrangement. Stevens adopts the local ways of stating stowage rates at various places, and hence his *data* is not always in the form most valuable for practical use. One unit which he uses largely is now rapidly becoming obsolete. The *keel* of 850 cubic feet, equivalent to 21 tons 4 cwt. of Newcastle coals, is seldom applied even to coals and scarcely ever to any other article of commerce; but Stevens, in his Table of "Goods proportioned in Stowage," bases his figures upon the *keel* as unit. In spite of this and some other features, which reduce the value of the work in the present day, "Stevens on Stowage" is still the standard work upon the subject, and all who write upon the question must be largely indebted to it. Proportionate weights of various articles are sometimes stated in terms of pounds avoirdupois to the bushel, sometimes cubic feet to the ton weight; and again as of so much specific gravity, that is, of so many times the weight of the same quantity of water at standard temperature. The two first-

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named ratios are the most useful in connection with the stowage of ships, grain is largely freighted by the bushel, and, in comparing weight with stowage room, it is convenient to know how many cubic feet go to the ton, seeing that space in the hold is stated either in cubic feet or in freight tons of 40 cubic feet each. For the purpose of converting one ratio into the other, it only needs to be remarked that the imperial bushel contains 2218·192 cubic inches, or 1·2837 cubic feet.

We purpose stating from various sources of information the stowage rates of a number of the more common articles of commerce, stating the authority in each case. "Stevens on Stowage" is in the hands of every shipmaster, and therefore our references to that work will be very brief, the information we give being supplementary to it.

Commencing with grain, it may be best to begin with the results of some recent very careful weighing and measuring, conducted by Mr. Isaac Roberts, at Liverpool, and stated in a paper in the Royal Society's Transactions, January, 1884. Mr. Roberts conducted a series of most interesting experiments to determine the vertical and lateral pressures of corn in bins, and arrived at the singular result that with regard to wheat and peas (the grain used in the experiments), that if the base of the bin be a regular figure, the maximum vertical pressure upon the base is reached when the corn inside is of a height equal to double the diameter of the inscribed circle in the base, and that beyond this limit, however high the grain inside, there is no greater pressure upon the floor of the bin. Mr. Roberts's determinations of the weights of grain are especially valuable, inasmuch as the weight is given when loosely filled into the measure, and also the weight of the same grain when pressed and carefully packed in the measure. They are as follows :—

	Loosely Filled into Measure.		Closely Filled and Pressed.	
Wheat :—	Lbs. per Bushel.	Cubic ft. per ton.	Lbs. per Bushel.	Cubic ft. per ton.
Red Winter ...	62·9	45·7	68·	42·3
Bombay	62·9	45·7	68·	42·3
California	62·9	45·7	68·	42·3
Walla Walla ...	59·	48·7	64·8	44·3
Bessarabia ...	62·9	45·7	68·	42·3

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	Loosely Filled into Measure.		Closely Filled and Pressed.	
	Lbs. per Bushel.	Cubic ft. per ton.	Lbs. per Bushel.	Cubic ft. per ton.
Peas, American	64·2	44·8	69·3	41·5
Maize :—				
White American	55·8	51·5	60·3	47·7
Mixed ,,	56·5	50·9	60·3	47·7
Oats, Russian	35·9	80·	42·4	68·
Beans, Egyptian	59·	48·7	64·2	44·8
Barley, English	50·1	57·4	56·5	50·9

It thus appears that the gain in the stowage due to closely filling and pressing was as follows :—

Wheat	8 per cent.
Peas	8 ,,
Maize	7 ,,
Oats	18 ,,
Beans	9 ,,
Barley	13 ,,

The following table was obtained from careful weighings in London Dock Warehouses in 1881 :—

	Lbs. per Bushel.	Cubic ft. per Ton.
Linseed, Calcutta	51·3	56·
,, Bombay	52·	55·3
,, Black Sea	53·	54·1
Rapeseed, Calcutta	52·	55·3
,, Black Sea	53·	54·1
Oats, English	42·	68·4
,, English, Black	38·5	74·7
,, Swedish	42·	68·4
,, Russian	38·5	74·7
Barley, Russian	52·5	54·8
,, Scotch	57·3	50·2
,, English	52·5	54·8
Maize, American, Russian & Galatz	60·	47·9
Peas, English	65·3	44·
,, American	63·	45·7
Beans, English	66·5	43·2
,, Spanish	63·	45·7

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We have not space, and it would be useless for the reason we have stated above to give the figures stated by Stevens in detail, but we give the range of rate for each kind of grain, and in addition state the ratio in cubic feet per ton.

	Lbs. per Bushel.	Cubic ft. per Ton.
Wheat	56 to 66	50 to 43
Wheat, Egyptian (which is exceptionally light)	45 to 55	64 to 52
Maize	54 to 63	53 to 46
Barley	47 to 55	61 to 52
Oats	35 to 44	82 to 65
Peas	62 to 66	46 to 43
Beans	54 to 63	53 to 46
Linseed	57 to 60	61 to 48
Rapeseed	48 to 53	60 to 54
Rice	54½ to 64	53 to 45

In these last two sets of figures the cubic feet per ton, like the pounds per bushel, is for grain measured out, and therefore in estimating the content of a ship's hold, stowed in bulk, allowance has to be made for compression. On the other hand, if the grain be in bags, there is a loss due to that cause. Experimental weighings and measurings have shown that wheat in bags will, even when compressed by careful stowage in a large rectangular bin, occupy about 6 per cent. more cubic feet per ton than when the same grain is measured out loosely.

Cotton seed was given by Mr. W. Denny, of Dumbarton, in a storage diagram as 55 lbs. per bushel, 52 cubic feet per ton.

Flour in bags, Mr. Purvis ascertained through Messrs. Wilson, Meyer & Co., of Liverpool, to be 43·2 to 46·7 cubic feet per ton weight.

Mr. Purvis deduced from figures given by Stevens that Chinese tea when packed occupies space as follows :—

	Chests.	Half Chests.
Black varieties	95	105 to 106
Hyson	120	134
Gunpowder	—	99

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While from Messrs. Galbraith, Pembroke & Co. he obtained the figures :—

India Tea ...	...	...	85 cubic feet to 1 ton.
China ,, ...	...	...	90 ,, ,,

And from the latter source :—

Sugar, Java, in baskets	46·1	to 52·8	cubic feet to 1 ton.
,, Demerara, in bags	41·1	,,	,,

Regarding the stowage of textile fabrics, Mr. Purvis appears to have been at great pains to collect information, which for cotton is as follows, the figures in all cases being the number of cubic feet to 1 ton weight :—

Firm, by whom supplied.	American Cotton.	Egyptian Cotton.	Indian Cotton.
Messrs. Galbraith, Pembroke & Co. ...	—	—	64 to 111
Messrs. Ismay, Imrie & Co.	109	71	61
Messrs. E. Bates & Sons	—	—	54
Messrs. F. Leyland & Co.	106	65	50
Messrs. Jas. Moss & Co.	129	64	61·8
Messrs. Henderson Bros.	—	—	65·3

From evidence given before a Court of Inquiry into Cotton Fires, held at Liverpool last year, it appears that American cotton averages 121 cubic feet to a ton weight, Egyptian 68, and Indian 50.

Jute, on the authority of Mr. Carmichael, of Greenock, is given by Mr. Purvis at 49 to 77·6 cubic feet to the ton; the lighter being hand-pressed, the heavier hydraulic-pressed.

Wool is given (New Zealand), on the authority of Messrs. Galbraith, Pembroke & Co., as follows :—

Dumped, greasy ...	...	84	cubic feet to 1 ton.
,, scoured ...	...	100	,, ,,
Undumped	...	235	,, ,,

Cape of Good Hope wool, by Mr. G. Scott and Messrs. Donald Currie & Co., at—

Pressed and bound, greasy ...	188	cubic feet to 1 ton.
,, ,, scoured	280	,, ,,

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Accounts of Manchester bales were obtained from various firms as follows, in terms of cubic feet to a ton :—

	Yarn Goods.	Piece Goods.
Messrs. Ismay, Imrie & Co. ...	—	88
Messrs. E. Bates & Sons ...	49	50
A firm not named...	80-160	40-80
Messrs. F. Leyland & Co. ...	80	60
Messrs. Jas. Moss & Co.	41	54
Messrs. Henderson Bros.... ...	59-67	57 (cases)
,, ,, ,, ...	—	43-47 (bales)

A weight and measurement taken at Messrs. W. Denny & Bros., at Dumbarton, gives an account of the space occupied by pig iron stowed as close as possible, wood packing being used in quantity only sufficient to keep pile up, gives a rate of stowage of 9·17 cubic feet to 1 ton.

Lastly, we come to the question of the stowage of coal. It is usual to reckon bunker coal as occupying 45 cubic feet per ton. Mr. W. Denny had measurements made of four distinct kinds of Scotch coal which varied from 39·5 to 45·6 cubic feet per ton. Mr. Guthrie, of Cardiff, gives the weight of Welsh coal, including the well-known varieties Powell's Duffryn, Nixon's Navigation, Ocean Merthyr, Ferndale Merthyr, and Hood's Merthyr, at 40½ to 41 cubic feet per ton.

In giving the above particulars we have not thought it necessary to take up space by repeating figures which everyone interested may obtain from the standard book on the subject, but we have collected from other sources, information which will, we believe, be found very useful. It is much to be desired that the standard work on stowage should be re-edited, in order that fresh information may be incorporated with it, and also that the facts and figures may be stated in the form most useful for present use.

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TIDAL PHENOMENA AND OCEAN CURRENTS.

THE mode in which tidal phenomena actually occur, and the cause to which ocean currents are due, are, of course, matters of great practical importance to the navigator, and the questions involved in them can hardly fail to be of interest to all ship captains and officers to whose knowledge, skill, and vigilant care a vast number of human lives, and property to an enormous amount of value, are confided.

It is to be taken for granted that every navigator who has to conduct a ship over-sea from one place to another is acquainted with at least some of the elementary facts of astronomy, whether for ascertaining or verifying his latitude and longitude at any time during his voyage, or for any other purpose connected with his profession. But it may be that the astronomical influences by which, according to the explanations given by astronomers, the oceans of the world are affected, are not sufficiently borne in mind and allowed for in regard to their mode of operation, and perhaps it is open to question whether the stranding of ships which so frequently occurs, may not sometimes arise from causes connected with the tidal condition of the ocean, as to which no satisfactory solution has been arrived at by astronomical and geographical experts. Such mishaps sometimes happen almost without any apparent cause, often, seemingly, without any want of skill or care on the navigator's part, though perhaps upon official inquiry into the cause of a casualty, it is discovered that had soundings been taken the misfortune might have been avoided, when, possibly, the navigator himself at the time, may really have carefully consulted his chart and have seen no reason whatever to suspect the proximity of shoal water. It may therefore be useful to analyse some of the circumstances out of which important changes in the condition of the open ocean are ever being evolved, and especially if it can be shown that great allowances ought always to be made, not only for continually progressive alterations in the direction and velocity of currents, but for variations in the depth of the water subsisting at any time in approaches to harbours and rivers, or by

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which sandbanks, shelving shores, sunken rocks, or other unseen obstructions to navigation may be covered.

From an astronomical point of view, the subject of ocean tides appears to be antecedent to that of the ocean currents. It is proposed therefore to consider—(1) How tidal effects are produced; and (2) In what way they are manifested.

As to Ocean Tides.

(1.) As described by astronomers, the tides originate in "the principle of forced oscillations or forced vibrations," in consequence of which, the motion of one body—of the sun or moon for instance—produces a corresponding effect on another body. The tides are "forced oscillations excited by the rotation of the earth in an ocean disturbed from its figure by the varying attractions of the sun and moon, each revolving in its own orbit and propagating its own period into their joint phenomenon." As regards the part of the tides which is dependant on the moon, that luminary not only heaps up the waters under her, but at the same time heaps them up on the opposite side of the globe—an effect resulting from "the differences of her attractions at the two surfaces and at the centre." "The moon's attraction acts to force down the water at the sides at right angles to her direction, and raise it at the two ends of the diameter pointing towards her," the result being "an immensely broad and excessively flat wave (not a circulating current), which follows or endeavours to follow the apparent motions of the moon." The sun acts in like manner, the effect of its influence being sometimes superimposed upon that of the moon, sometimes transverse to it, so as to partly neutralise it.

The foregoing is, in effect, an abstract of the explanation concerning the tides as contained in Sir John Herschel's "Treatise on Astronomy." Transposed into non-scientific language the tidal theory, as so explained, may be stated as follows:—

The waters of the ocean are held to the earth by the earth's attractive power or influence—that is to say, by gravitation. But the sun and the moon also exercise an influence upon them so as to overcome to some extent, the power of the earth's gravitating influence. Of the two luminaries, the moon exercises the greatest

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influence owing to her nearer proximity. The ocean is therefore affected by three influences:—(1.) The influence of the earth. (2.) That of the moon. (3.) That of the sun. As regards the gravitating influence of the earth, *but only as exercised at any one parallel of latitude*, it always remains the same, and *to the extent that the ocean waters do not form part of the so-called tidal-waves, they are carried round upon the globe* with the globe itself, by means of the globe's diurnal rotation upon its axis.

As to the moon's influence the following is an effect of it. Near to any place in the heavens where the moon is most nearly vertical over any part of the globe, from there the lunar influence upon the waters is most strongly exercised, and under that place as well as upon the side of the globe diametrically opposite to it, the ocean waters are "heaped up," and the lunar tidal depth of water is greatest. *The lunar so-called tidal wave, however, is not carried round upon the globe by means of the diurnal rotation.*

The effect of the sun's influence upon the ocean may be similarly described—that is to say, from near to any place in the heavens where the sun is most nearly vertical over any part of the globe, the solar influence is most strongly exercised upon the waters, and under that place they are "heaped up," and the solar tidal depth of water is greatest, and a like effect ensues upon the side of the globe diametrically opposite to that place. *As in regard to the lunar, so as to the solar tidal wave, it is not carried round upon the globe by means of the globe's diurnal rotation upon its axis.*

There are thus, in each hemisphere, two tidal waves or masses of water whose respective vertices or deepest parts are always nearly under the luminaries which produce them; that is to say, almost under the producing luminary and at the part of the globe diametrically opposite thereto.

(2.) For the purpose of considering the way in which tidal effects ensue, it may be convenient to analyse the mode of their production in further detail.

The so-called tidal waves consist of the drawing up, or heaping up, of the ocean waters *towards* the producing luminaries on the ide of the globe over which the sun or the moon, as the case may

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be, are vertical at any time, and *from* the luminaries on the opposite side of the globe.

As regards the solar tidal waves, their vertices or deepest parts are always upon those parts of the globe which are under the ecliptic, that is to say, the vertices or deepest parts are always somewhere within the limits of the tropics, and by reason of the earth's journey in orbit, the ocean-bed in different geographical latitudes lying within those limits, is ever progressively in the course of each year being brought under those vertices or deepest parts. In effect, therefore, the two solar waves with their vertices always nearly under the ecliptic, pass round the globe in the course of the year correspondingly with the advance of the sun in longitude.

Having regard to the mode in which the solar influence is thus exercised; that is to say, coming as the greatest amount of that influence does from the place in the heavens where the sun is situate, and acting upon the spherical surface of the ocean—it is to be assumed that the depth of the solar tidal waves diminishes in all directions around their vertices or deepest parts, to the extent of 90 degrees therefrom, and it follows (1) that the semi-diurnal occurrence of solar high water in any latitude, arises through the ocean bed being brought by the earth's rotation upon its axis, as near to the deepest part of the wave, and to be as deeply immersed under it, as it can be thus brought; and (2) that both the time and the depth of solar high water change from tide to tide, correspondingly with the earth's motion in orbit, or, in other words, correspondingly with the sun's progressive change in longitude and declination.

With respect to the lunar tidal wave and its counterpart on the opposite side of the globe, effects more complicated than those produced by the sun, ensue in consequence of the moon's journey in orbit round the earth in the course of the lunar month. In that period the lunar tidal wave and its counterpart, pass round the globe, with their vertices nearly along that part of the globe over which the moon revolves vertically; that is to say, over the part which lies in the plane of the moon's orbit. The line thus described round the earth, monthly, by the vertices of the lunar

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wave and its counterpart, is not exactly in the line described by the vertices of the solar tidal wave and its counterpart in the course of the year—that is to say, it is not exactly in the plane of the ecliptic, but it diverges from and crosses that plane at an angle of a little more than five degrees at the points of junction or nodes—that being the angle at which the plane of the lunar orbit, at the line of the nodes, diverges from the plane of the ecliptic. But while the lunar tidal waves do not, therefore, exactly coincide with those produced by the sun, yet the line described by their vertices is not very far from the line in which the vertices of the solar waves become progressively situate. As the lunar tidal waves pass round the earth in the course of each lunation, they may be said to cross the solar waves obliquely, at the angle mentioned, as at the times of new and full moon when spring-tides occur through the lunar waves becoming then mingled with and added to the solar. The lunar waves then begin to part from the solar, and continue to do so until the moon arrives in quadrature or at its furthest distance from the ecliptic, when the vertices of the lunar waves are at their furthest distances from the vertices of the solar waves, whereupon the tides begin to increase gradually in depth through the solar and lunar waves becoming more and more commingled as the moon approaches the position of conjunction or opposition, as the case may be, and so on alternately according to the continued motion of the moon in its orbit, and modified by the part of the journey meanwhile performed by the earth in its orbit.

Now, although it seems to be almost necessarily inferrible from the astronomical explanation of the tides, that the currents of the open ocean are a consequence of them, yet the tides themselves, or the "heaping up" of the waters in the manner described, are *not* currents, or water in a state of flow and reflow, and paradoxical though it may seem, yet a "flowing" tide as manifested at any place—at any harbour which is open to the sea, or upon any sea-shore, for instance—cannot be said to consist of a tidal rise, nor an "ebbing" tide of a tidal fall of water, but the effect is caused by the gradual and successive change in the position of the different parts of the ocean-bed with reference to the tidal water or so-called tidal-wave. That such is the case is obvious, for the

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attractive influence of the sun and moon to which tidal phenomena are due as a primary cause, is continuously exercised by the luminaries themselves; that is to say, from that part of the heavens wherein they are respectively situate, and it is certain that neither the sun nor moon revolve round the earth synchronously with the tidal effects which are manifested twice, and at some places four times or more daily.

Produced as the daily tidal alternations are by the influence of the sun and moon in combination with the diurnal rotation of the globe upon its axis, it is plain that in consequence of the "obliquity of the ecliptic" considerable changes must be continuously occurring throughout the course of each year, in regard to the place where, successively, the vertex or deepest part of each tidal wave becomes situate, and as it is necessarily inferrible that the depth of those waves, respectively, diminishes in some proportionate measure, reckoning from their vertices to their furthest or shallowest extremity, it follows that the tidal depth of high water at any place must undergo a corresponding change, owing to the place being brought, by the earth's rotary motion, at each successive tide into a deeper or shallower part of the tidal wave than that into which it had been last brought.

Thus it theoretically ensues that the shifting of the solar and lunar tidal waves should be of a very complicated character. The high-water depth of the tidal water over every place which it covers, is ever becoming alternately shallower or deeper from tide to tide between each bi-monthly recurrence of spring tides and neaps. It similarly changes in enhanced measure twice during each year in consequence of the earth's motion in orbit; that is to say, between the time of one equinox when it is deepest to the time of the following solstice when it is shallowest—then gradually deepening again till the next equinox is reached, and then gradually shallowing until the following solstice occurs. And in addition to those progressive alterations or variations in the depth of all parts of the tidal water, it can hardly be otherwise than that other variations of a similar character should arise from the small elliptical motion of the earth out of which the "nutation" of its axis occurs in the course of a period of between 18 and 19 years,

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and still further from the "revolution of the moon's apsides" during which such a progressive and retrogressive change takes place in the lunar orbit in about a period of nine years as to effect a gradual alteration in the distance of the moon from the earth.

Bearing in mind the astronomical influences in which tidal effects thus originate, and the ever varying and complicated manner in which those influences are exercised, the conclusion seems inevitable that as regards *depth of water alone*, great variation of oceanic conditions should ensue.

The ocean waters being drawn by the solar and lunar influence out of the shape they would assume—spheroidal, or whatsoever—but for those influences, the so-called tidal waves may be said to represent the extent to which the waters are so drawn out. What that extent is, and what the exact manner in which they are thus effected, does not appear to have been practically determined. And seeing how intricate and complicated are the circumstances out of which the tides are evolved, a precise elucidation of the subject hardly seems possible. The extent, in depth, to which the ocean waters are sensibly influenced at any one place—the depth of the tidal waves at their vertices or deepest parts—the ratio or degree in which their depth is graduated from their deepest to their shallowest portions—the alterations in depth at their different parts occurring throughout the intermediate stages between spring-tides and neaps—are but a few of the many incidents connected with the subject as to which little, if any thing at all, is really known. It is true that most useful observations are made and recorded at most of those ports and harbours of the world whereto ships are accustomed to resort, including the set of the tides and the increasing or diminishing depth of water at different times—both of which effects are supposed to vary (though, perhaps, upon insufficient grounds), according to the strength and direction of the wind. It is scarcely imaginable, however, that such measurements afford a correct criterion of the depth of the water which constitutes the tidal waves themselves. Where, for instance the approaches to a shore or coast are covered by merely a few fathoms of water, it can hardly be that the apparent tidal rise and fall there is owing to the direct action of the solar and lunar influence upon

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the contiguous shallow water. The phenomenon would seem to be more in the nature of a resulting incident, than of a direct effect. A consideration of the causes which produce the tides, would seem necessarily to lead to the inference that the situation of the tidal vertices is at certain parts of the ocean where the water is deep. Hence the manifestations of a flowing tide in any estuary and along any coast or shore, is an effect *consequent upon* the sea-bed over which the tidal wave becomes situate, being brought by the earth's rotation upon its axis, under the deepening part of such wave; and when the shallowing part of the sea-bed comes towards it, the solar and lunar influences gradually take off—that is to say, they no longer affect the water there to any appreciable extent—and then, by the force of the earth's gravitation, the tidal water must *descend* towards and along the shore, producing the manifestations of a rising tide (including the gradual stoppage of out-flow from the rivers there), until the deepest part of the tidal wave in that latitude is passed; whereupon by the continuing rotation of the globe, a reverse process ensues—the neighbouring ocean-bed is gradually brought under the now shallowing part of the wave, and an *ascending return* takes place towards those parts of the ocean where the waters are most powerfully drawn up by the solar and lunar influences, and *from which parts* the eastward rotary motion of the earth is carrying that coast or shore. Under the circumstances described, it seems plain that if a ship anywhere at sea had no motion of its own through the water, and if the water there had no onward movement in any direction—that is to say, if there were no current there and the ship were consequently stationary—then, even in such case, a different part of the sea-bed would be continually being brought beneath that ship by means of the earth's rotation on axis, and every near or far-off coast or shallow sea-bottom or rock, or island, to the westward of the ship would be, continuously, being brought nearer to her, while every such coast, &c., to the eastward would be travelling further from her. In such supposed case the effect would be the same as if the ship were being insidiously and imperceptibly carried in one direction or the other; that is to say, either towards, or further from possible danger as the case might be.

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If such be a correct interpretation and analysis of the circumstances which produce the tidal phenomena, an important result in connection with navigation would ensue, namely, that the position of a ship at sea in relation to any coast or shore, or to any rock, sandbank, or island, or to any land whatever, would be affected to an important extent by tidal influences, independently altogether of the influence of currents and winds, and also independently of the vessel's own motion through the water. If, for instance, she were over some deeper part of the ocean, she might be assumed to be in tidal water; that is to say, in a part of the ocean where the water is directly affected by the solar and lunar influences, and beneath which part of the ocean, different parts of the ocean-bed are being continually and successively brought by means of the globe's rotation upon its axis. Of course, a ship is never thus stationary. By means of wind or steam, or both, she usually has a motion of her own through the water of greater or less velocity, and she is subject to the influence of currents in almost any part of the ocean wherein she may happen to be. Moreover, the tidal waters may, in fact, be regarded as merely consisting of those incessantly changing parts of the ocean which are drawn up towards the sun and moon in such wise that the external form or shape of the ocean, as a whole is different from that it would permanently assume, but for the influences of the two luminaries; and the general condition of the ocean, including the changing effects produced by the solar and lunar influence, may be said to be normal, and such, that results which would ensue if the tidal influences were exercised in the exact manner inferrible from theoretical analysis, do not take place otherwise than in a modified degree. It is a matter of experience that shores and coasts are not dashed into the tidal waves at the terrific rate at which the globe's surface is carried round by the diurnal rotation. For *althouyh those waves are not so carried round*, and may, with reference to that motion be regarded as almost stationary, yet long before the shore or coast can reach the position where the sun and moon exercise their greatest tidal influences, the effect of those influences begins to abate through the gradual diminution of the depth of water covering the sea-bottom, until at last they become well nigh nugatory, as the shelving

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and shallowing shore continues to be thus brought round. But while the water, through such its gradual diminution of depth, becomes less and less amenable to the solar and lunar attractive force, it becomes more and more amenable to the attraction of the earth. Whether or not it actually retreats or flows from where it had been previously "heaped up," yet at least it is met by, and it overflows the shallowing shore, until the "high water" of the coast occurs. The sea-bed, and such of the oceanic waters as do not yield to the solar and lunar forces, continue their eastward journey—the position where that force is most effective is passed —a converse action follows—the coast and its shelving sea-bottom leave the greatest tidal force behind, and continue to pass beneath the now shallowing portions of the tidal waves, until once more the position where the tidal forces begin to predominate is again reached, and a repetition of the flowing tidal manifestations occurs.

As affecting navigation, then, what is the outcome of the foregoing analysis? It would seem to be manifestly this—that with reference to any coast or shallow water which a ship may be approaching, or in the proximity of which she may happen to be, it is never safe to rely upon the ship's dead reckoning, or upon anything else than actual verification of position, whether by unmistakable lights or land-marks, or by the use of the sextant. If lights or land-marks, and the sun, or the moon and stars are obscured, a navigator, even in waters which he knows full well at all times of the year, may discover, when it is too late, that the tedious process of plying his lead would have saved him from disaster. In these days of iron ships, and of cargoes of machinery or other iron goods or ores, with a break-neck pace of steaming, it would seem especially desirable to bear in mind, not only that the magnet has its vagaries, but that tidal effects are ever varying, and are extremely insidious in character, for they may be causing a ship to be imperceptibly stealing on towards danger, or they may be mysteriously shallowing the water beneath her. And when to these possible incidents are added those connected with the progressive and retrogressive, or it may be, the permanent though gradual changes in the direction and velocity of currents which are ever taking place, the adoption of all available precautions against

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casualty would seem to be the more peremptorily expedient on the navigator's part.

An analysis of the circumstances which seem to indicate that ocean currents are attributable to tidal influences, will be reserved for a future occasion.

THAMES NAVIGATION.

IN the estuary of the River Thames, the principal fairway for the general traffic leading up from the North Foreland, is the Princes Channel, from which vessels have either to turn off into the Alexandra Channel or continue on through the Girdler passage, both courses leading into the Oaze Deep, or Knob Channel, from whence, owing to the complete system of guiding lights and buoys, navigation is comparatively safe and easy up the river. But for ships of deep draft, say over 20 feet, neither the Alexandra Channel nor the Girdler passage is available at low water, the depth being then insufficient, consequently such vessels consisting for the most part of the largest and most valuable steamers coming to London, have frequently to anchor for some hours off the North Foreland, or in the Princes Channel, waiting, at some risk, if the weather is bad, and certain inconvenience and delay under any circumstances, until there is sufficient water for them to proceed in safety. It is with the object of affording such large maritime traders additional facilities for making their passages into and out of our great port, and to render unnecessary the inconvenient detention to which they have hitherto been subject, that the Trinity Board have taken the necessary steps for making another channel navigable for ships of the deepest draught at all times of tide by day or by night.

This new channel has under various names existed for more than 50 years. Once it was known as the Smugglers' Swash, subsequently it received the name of Thomas's Channel, after-

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wards its name was changed to that of the Bullock Channel, and finally, on being buoyed in 1882 by the Trinity Board, it was named the Duke of Edinburgh Channel, in honour of the Royal Master of that ancient corporation. Up to that date the channel had steadily increased in capacity, until it was considered expedient to mark it out by buoys for use in the day time, but of late years the shipping interests have been very desirous that this channel should be lighted, so that it might be navigable at night time. Owing, however, to the impecunious condition of the Mercantile Marine Fund, upon which the cost would be chargeable, this admittedly desirable undertaking has had to be postponed from year to year, but, now financial matters being presumably in a more satisfactory condition, the work has at last been carried through, and since the 18th December, the Duke of Edinburgh Channel has been open for the passage of the largest ships at all times of tide by day or night.

The channel itself leads from the open sea into the Black Deep, which communicates directly with the Oaze and Knob passages. It has a least depth of 37 feet at low water, which is ample for the largest ironclad or merchant ship afloat, and its narrowest part is a little more than half-a-mile wide.

To give a good lead from seaward into the Duke of Edinburgh Channel, the Tongue Light-vessel, with a powerful light and fog-signal, has been moved out to the eastward two miles, to a position close to that hitherto occupied by the Tongue Knoll Buoy, which mark is superseded by the lightship, the latter in her new position still affording an excellent guide into the Princes Channel. To compensate for this alteration, so far as the Princes Channel is concerned, the Princes Channel Light-vessel has also been moved two miles to the E., her new position being off the southern projection of the South Shingles Sand at the narrowest part of the channel, superseding the Shingles Spit Buoy, while higher up, the small buoy marking the S.E. end of the Girdler Sand, is replaced by a gas-lighted bell buoy. By these changes, the general lighting of the Princes Channel is greatly improved.

With the Tongue Light-vessel furnishing an excellent lead for the entrance of the Duke of Edinburgh Channel, the chief guide through the passage is a new lightship, called Edinburgh Channel,

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placed about midway on the N.E. side, the narrowest part of the waterway being here situated between a shoal patch in the middle of the channel, suitably indicated by buoys, and the lightship. Where the channel debouches into the Black Deep, another new lightship is moored, called the Black Deep, which, in conjunction with a gas-lighted buoy off the N.E. projection of the N. Shingles Sand, affords an effective indication of the necessary turning point into the Black Deep. To complete the lighting of the fairway to the Knob Channel or into the Oaze Deep, the Knock John and the Knob Buoys are altered to gas-lighted buoys, and thus the new night course is simply and effectively marked out.

The practical advantages of lighting up these channels will be that deep-draught steamers bound to the Thames can, in clear weather, keep under way at full speed, and run right up the river if the tide serves in the upper waters, or anchor in safety between the Mouse and Nore lights; and outward bound steamers leaving the docks at high water can proceed direct to sea without waiting at all. Her Majesty's ships will also be now enabled to pass out to sea at any time of tide, a possibility which had recently become endangered by the shoaling of the water in the North Channel.

The placing of four new gas-lighted buoys is a marked feature in this development of the marking of the Thames entrances, and bears out the anticipations of their extended employment made in these columns last year. In order to prevent the lights from these buoys being mistaken for the anchor lights of small vessels or fishermen's lights, they are all made occulting; the ingenious mechanism for automatically producing the occultations being the patent of Pintsch's Lighting Company.

The combination of sound and light in the gas-lighted bell-buoy is quite a novelty in our waters, and it will be interesting to learn the opinions of shipmasters and pilots as to its practical efficiency.

The lightships are illuminated by means of mineral oil having a flashing point (close test) of 250° Fahrenheit; the distinctive characteristic for the Edinburgh Channel Lightship is one powerful white flash every five seconds, and for the Black Deep vessel four quick flashes every half-minute.

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The effect of this great improvement will doubtless be to still further augment the increasing number of deep-draught and large tonnage steamers using the port of London, probably drawing some of them from Continental ports, and enlarging the shipping trade of the port in respect of both passenger traffic and conveyance of the heavier descriptions of merchandise.

CIRCUMNAVIGATING CEYLON.

SOME years ago I was serving in a vessel engaged by the Honourable East India Company to collect the Government's Revenue at out-of-the-way places on the Coromandel Coast, my ship being under the orders of the Madras Government. She was a small screw-steamer, called the *Manilla*, belonging to the Peninsula and Oriental Company, of 646 tons burden and 290 H.P., drawing about 12 feet of water, and therefore able to traverse safely the shallow waters of Palk's Bay, and to visit such ports as Tutticorin and other places in the vicinity of the Paumben Pass and Adam's Bridge, as the service we were employed in required. Readers of the *Nautical Magazine* will at once gather from the fact of the Honourable East India Company holding sway in India at the time I refer to, that I am speaking about a time prior to the transfer to the Crown of our great Eastern possessions; but the lapse of thirty-two years does not appear to have materially altered the conditions under which the circumnavigation of Ceylon is habitually performed in our ships passing either from the Red Sea to the Bay of Bengal, or from the west to the east coasts of the great Indian Peninsula. In the process of making this detour, a vessel has to steam one hundred and twenty-five miles south of Cape Comorin before hauling to the eastward. After she has passed Point de Galle and got well clear of Dondra Head, the southernmost point of Ceylon, and when northing is safe into the course shaped either for Madras or Calcutta, there are the Great and Little Bassas Rocks

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staring you in the face and necessitating another divergence from the direct line to your destination. As for the Bale of Cotton Rock, so few mariners I have ever met have seen it, that its existence bears somewhat of an apocryphal character in my mind. If it exists, however, it lies too far to the eastward to interfere with the route to which I am referring. Altogether, the difference to a ship from the Red Sea or Bombay bound to Madras or Calcutta, between the circumnavigation of Ceylon and making the passage close round Cape Comorin, through the Paumben Pass, if it were practicable, amounts in distance to about three hundred and seventy miles, and in time as much under thirty-seven or forty hours as improved steaming power will give her. To compare small troubles to great ones, let us suppose that the Scilly Islands were by some internal throe of the earth connected with the westernmost corner of Cornwall; that the rocks upon which the Longships light stands at the Land's End were extended into a series of stepping-stones for gigantic strides like those connecting Ceylon with the main land of India, at its N.W. end, called Adam's Bridge, where the foot-print in stone of our great progenitor measures five feet; suppose that this chain of rock had a gap in it capable of being made by engineering science a navigable channel, and that the approaches to the Pass only required deepening to make them available for our largest steamers, how long, may I ask, would the claims of commerce and the economy of time and money in shipping interests permit these obstacles to stand in the high road of navigation round Great Britain and at the entrance of the English Channel? Not long, we may be sure. And yet the inconvenience that would be experienced by the British mariner, did such an intolerable obstacle as I have described exist, is only, as a question of distance and time lost, about one-seventh part of what is now constantly incurred by his brother navigator in Indian seas when he sets about circumnavigating Ceylon, for the distance from the Longships light to the Bishop Rock light on the S.W. part of Scilly is but 45 miles. This distance means a very much shorter sweep out of the direct course any vessel would take in coming into the English Channel from any ports in the United Kingdom upon its northern and western coasts, or from St. George's Channel, than has to be

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made to pass round Ceylon as we have to do at present. While this has to be done the dangers at the south-eastern corner of the Island of Ceylon assume more importance than they otherwise would, and the question of how they can best be passed by navigators in safety and without loss of time arises. In the first place, I believe that distance can be saved by going inside the Great Bassas, and I will give my reasons for saying that the passage inside the Bassas might be made available under certain conditions, simply premising that the construction of a deep ship water-way round the north-west end of Ceylon joining the Gulf of Manar and Palk's Bay (or Straits) together, deepening the approaches through them (at present there is only 14 feet in parts) would put the Bassas "out of court" as an appreciable danger, except for ships making the south-eastern corner of Ceylon from the Straits of Malacca, or the eastward and Australian ships bound to west coast Indian ports. The biggest of the Great Bassas Rocks is a conical-shaped, whitish-coloured mass which, when I saw it last in a steamer bound with the homeward China mails from the Straits for Point de Galle some years ago, presented a remarkable appearance standing isolated, as it were, on the sea some six or seven miles from the land and visible itself quite as far as that in clear weather with the sun shining on it. In those days there was no light either upon it or the reef known as the Little Bassas, which lays 12 miles north and 20 miles east of the larger danger.

At present the Great Bassas has a good light upon it, visible 16½ miles, revolving every 45 seconds. The light stands upon the big rock. The latitude of the lighthouse is 6° 11′ N., longitude 81° 28′ 5″ E. The Little Bassas has a light-vessel showing a flash light every one and a-half minutes. It is visible 10 miles, and is in latitude 6° 23′ 3″ N., longitude 81° 43′ 3″ E. It is moored inside the reef in five fathoms water, the centre rock bearing N. by W. ½ W., distant half-a-mile. "These rocks," says Imray, in his *Lights of the World*, "form an extremely dangerous reef; hence the light-vessel should always have a very wide berth." Now, this remark may be taken to apply to a vessel either approaching the danger on its eastern or sea-board side, or to a coaster taking the inside passage, as no doubt small vessels

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acquainted with the locality may do. An inspection of the latest charts will show that between the Great Bassas and the Island of Ceylon there is a passage of from five to six miles wide without any obstacles of any kind in the way, offering a clear course, with from 12 to 14 fathoms water through it.

The channel between the Little Bassas and the main is, however, more intricate. There is as much as 7 fathoms of water nearly all through it, but in the middle lies a shoal patch with but 3 fathoms on it, most likely a rock, for there are a number of rocks about in the passage, and on another patch near the already mentioned only 2¼ fathoms. From this it would seem that the passage between the Little Bassas and the Main is too intricate a one for a navigator not thoroughly posted up in local knowledge, or not having a pilot familiar with that part of the coast. It may seem to some who read this that to attempt such a passage as that between the Little Bassas and the Main would be running a needless risk; but, on the other hand, the modern requirements of the time demand a thorough knowledge of what short cuts can be made wherever our steamers ply, and in whatever part of the world they may be trading.

The trade road round the Island of Ceylon, between the Coromandel and the Malabar coasts, between Calcutta and Madras and Bombay is a very considerable one, and everything tending to advance its interests is worthy of notice, as every year adds to its amount. The importance, therefore, of accurate knowledge and an intelligent appreciation of dangers on such routes as the one mentioned cannot be exaggerated. With regard to the feasibility of a grand water-way round the north-western corner of the Island of Ceylon, and through the Paumban Pass, perhaps it may not be out of place to refer here to one of our best Indian authorities, Mr. William Thomas Thornton, C.B., who, in an article on "Public Works in India in 1875," says, as follows, in speaking of ship canals: *—"Of such canals India possesses one, and projects have been mooted for providing her with a second and a better. The portion of mainland nearest to Ceylon is the Promontory of Ramnad, separated by the

* *Gazette* of India.

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Paumban Channel from the island Ramisseran, where a chain of rocks and shoals, styled Adam's Bridge, extends to the Island of Manaar, which again is divided only by a narrow streak of water from Ceylon. For several years past Paumban Channel has been the subject of progressive improvements, and has been converted into a navigable passage from 80 feet to 150 feet wide, and from 11 feet to 14 feet deep, through which about 2,000 coasting vessels, of an aggregate burden of nearly 200,000 tons, annually make their way. To deepen it beyond 14 feet throughout would be useless, as there is no greater depth in the approaches on either side; but either through Ramnad or Ramisseran a canal might be cut practicable for the largest European vessels accustomed to ply in the Bay of Bengal. The cost of the operation is estimated at about half-a-million sterling, interest on which at 4 per cent. would amount to £20,000, but the resulting advantages might probably enough be worth the outlay. The canal would indeed be used almost exclusively by steamers, in whose case, however, the voyage from the Red Sea or Bombay to Madras or Calcutta would be shortened by its means by 350 or 370 miles, representing to a vessel of 1,000 tons a saving of about 40 hours' steaming and a total saving of £85. At this rate the benefit to the extent of £20,000 a year would require less than 240 steamers, and the number of those that annually round Point de Galle on their way to Madras or Calcutta already exceeds 300, and is rapidly increasing."

I am aware that objections have been raised by eminent engineers from time to time against the project of a ship canal between Ceylon and the Main, and there can be no doubt that such an undertaking as would be necessary in view of the requirements of modern mail and cargo steamers must be an affair of some magnitude, as the approaches towards the actual Pass "through the Bridge" are obstructed by shallow water for some considerable distance as well as in Palk's Bay itself, which has only a range of about two and a-half and three fathoms over much of its extent. But these difficulties, great as they admittedly are, can hardly be held to be insuperable in the present day; and the advantages to the mercantile community, to navigators, and the

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public generally would be very great in the increased facility and shortened distance of the journey from the West to the Eastern shores of our great Indian continent.

It seems not improbable that objections to such a scheme might emanate from the Cingalese at the idea of their beautiful island being shut off as it were by the new ship canal from the line of communication which has made it—either at Point de Galle in old times or at Colombo in the present day—a sort of house of call for our steamers in the East. This, however, cannot be held as an objection likely to stand where such enormous benefit to the mercantile community would result from "cutting" Ceylon on voyages that have the Bay of Bengal for their destination, or the eastern ports of India. Whatever, therefore, may be advanced in opposition of such a scheme as the canal indicated by Mr. Thornton in the passage I have quoted from on the subject, it is clear that the idea has found favour with one who from his great knowledge of our Indian Empire ranks as perhaps the highest authority on such a subject. It is not therefore indulging in a chimerical dream when I express a sincere hope that ere long the circumnavigation of Ceylon will become a thing of the past.

FRANKLIN FOX,
Late Captain P. and O. Service.

THE BRITISH SOUTH AFRICAN COMPANY.

THE SCRAMBLE FOR LAND IN AFRICA.

HOWEVER great and well-deserved the representation of the British race may be as colonists, or the founders of empires, it is impossible for any Englishman to look at the new maps of Africa without feeling that his countrymen in regard to South Africa, have but badly maintained their ancient reputation, and that, in fact, England and her people have been caught sadly napping during the last generation, or even during the last ten years, in the late great European scramble for African dominion. Taking this new map, and

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regarding its various coloured demarcations, it is clearly and regretfully apparent that our ancient dominion of the Cape and our great prestige as South African landowners, and South African hunters and fighters for so many years, has been put to but very poor service in assuring and consolidating our position in South Africa. England has held the Cape, and has been the supreme master of South Africa since she took the country over from the Dutch, and it is absolutely certain that if she had thought proper, her territory, or her protection to the native tribes, might have been extended right up to the Portuguese possessions, without any State in Europe offering the least opposition, or even thinking it necessary to note a protest. Since her acquisition of Cape Colony, she has been regarded by Europe, and the whole of the civilised world, as the only great power with any right to protect the native tribes in South Africa, and, therefore, at any time during the last generation, she might have declared the whole country lying between Cape Frio on the Atlantic, and the mouth of the Zambesi on the Indian Ocean, as subject to her sway alone. Even during the last ten years, when we were the only power with ten lines of mail steamers connecting South Africa with London and with Europe, it would not have been too late to have reconsidered our position, and to have made some sort of provision for extending British dominion to the northward, whenever it pleased us to do so. Statesmen, Colonial Governors, or Colonial Secretaries, should have been able to see as far into the future as the present time, and to have consolidated a position which has been unfortunately left to time and to chance. The result of this want of sagacity is, that we are now embroiled with Portugal—not, by the way, a very serious matter—with a South African Republic, covering a very rich and extensive territory on our right, and manipulated by a foreign people, with sympathies directly inimical if not antagonistic to our own. On our left, we have a German colony, extending from the Orange river right up to the Portuguese possessions at Cape Frio, and ahead of us, Portugal making frantic efforts to join her dominions of Mozambique and Benguela, which, if she succeeded in doing, would entirely thrust us out from the rich lands lying between the 10th and 20th parallels of latitude.

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As it is, we have the mortification of seeing a mushroom power like Germany, holding dominion in South Africa, which we had always considered ours, and as extensive in geographical area as Cape Colony and Natal combined.

It will be remembered that in 1885 Germany sought to extend her protection to her own merchants who had settled near Angra Pequena, and who had failed to secure that assistance from the British Government, which they had every right to expect, having once been permitted to settle in English territory, and this protection resulted in Bismarck annexing the whole country on the Atlantic seaboard, extending some 700 miles along the coast and not less than 300 miles into the interior. Whalefish Bay, where we had a settlement, we kept, but of what use is Whalefish Bay to England, when the whole country at the back is in the hands of Germany? Had we extended our boundaries in the same way as has been done in Australia, and as the American people did after their war with the mother country, we should, at this day, have held about one-sixth of the African continent, but, as matters now stand, we very much resemble the feeble State of Denmark being shoved out into the North Sea on the slender peninsula of Jutland. Like Portugal at the present time, we contended that the land was ours because we had always thought that nobody would take the trouble to question our right to it, and because we had always said it was ours, but having no title deeds to show and to prove our possession, and no actual treaties with native chiefs, Germany seized the country which she had an undoubted right to, and which she will long hold as a menace against us in our far from friendly relations with the Dutch Boers on the other side. What, for example, would happen if those redoubtable half-savage farmers determined to throw in their lot with Germany? Could England hinder such an alliance, or could she help feeling that by such a connexion all her ideas of empire in South Africa were scattered into thin air? It can hardly be said that the situation has been lost in South Africa, but Great Britain has only been saved from falling into the position of a second or third rate power on that continent by the sagacity of such men as Sir William Mackinnon and Mr. Cecil Rhodes. The grand conception by the former of a British East

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African Company, set the latter gentleman thinking of the same thing in that extensive country which the Germans left to us to the eastward of the 20th meridian, and which occupies a section of Africa extending from the Orange River on the south to somewhat undefinable limits to the north, but which there is no reason to suppose may not ultimately extend to the equator, and encloses the rich gold fields of the Matabele country—itself nearly as big as England and Scotland—and the little known lands lying between the great rivers Limpopo and Zambesi. Such will be the extensive borders of the British South African Company, which came before the public on the first of last November with £1,000,000 of capital fully subscribed by men like the Dukes of Abercorn and Fife, Lord Gifford, Mr. Cecil Rhodes, and three other South African merchants, who, together with Mr. Rhodes, know perhaps more about South Africa and its great resources than any Government in Europe. It is a grand undertaking which will—if engineered properly — bring great wealth to the founders and directors; but one very regretful incident will tend to divest it of anything like magnificence, and that is the presence of a great German colony extending for 500 miles along its eastern border thus shutting, it off from the sea, and from a fourteen days' distance from London; while on its south-western borders it has the Boer Republic always inimical to its best interests. It is of little use saying now what *might* have been its landmarks if British Statesmen of a late generation had been endowed with that sagacity which in the matter of our colonies they have invariably failed in. They are now talking anxiously about Imperial Federation, but they have left the finest lands in South Africa to be cared for by private individuals, much in the same way as they left Captain Cook to the whole responsibility of annexing the Australian Continent on his own authority alone.

E. B.

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SOME CAUSES OF MARINE CASUALTIES.

NEARLY fifty years ago, the late Admiral Fitzroy told a Committee of the House of Commons that neglect of the lead was one of the principal causes of the losses of British merchant-ships. An analysis of the findings of Board of Trade Investigations into strandings and total losses of vessels other than fishing craft which have been held at home ports, as recorded during the past year in "Our Official Log," tends to indicate that there still remains great scope for improvement in this respect. Neither rotten nor aged ships seem to demand enquiry, despite energetic assertions to the contrary made in the last curiously-worded appeal of Mr. Plimsoll, which is highly suggestive. There may be born poets, but leadsmen must be made. Captain Lecky, in his *Wrinkles*, expresses the same fact in other words. If officers would but substitute instruction in heaving the lead for the unprofitable occupations of making sennit, or knotting rope-yarns for spunyarn, fewer ships would be lost owing to unreliable leadsmen. "Spunyarn," he happily says, "can be purchased at a ship-chandler's, but good leadsmen cannot." Proficiency in heaving the lead has never ceased to be an essential part of a seaman's curriculum, although a more extensive use of Sir William Thomson's invaluable sounding machine may reduce the method of obtaining the depth of water under a ship's bottom to a merely mechanical process. It is, however, not infrequently found that the proper handling of the "blue pigeon" is absolutely unknown to a large majority of a foreign-going ship's company. There was but one out of twenty-four seamen of the *Galicia* who could heave the lead without running a risk of braining himself. Some of these able-bodied seamen affirmed that although they had been eleven years at sea, yet they had never seen a hand-lead used. All of these men held V.G. discharges! Many will remember the old yarn of the incompetent leadsman in the chains who excused his shortcomings by declaring that he knew the tune, but had forgotten the words! The time-honoured plan of feeling

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the way along the land by casts of the lead at frequent intervals would appear to be good enough for collier brigs, but of quite a secondary consideration with the masters of small deep-water steamships, even when the land is hidden by fog. They would do well to bear in mind the words of the old English poet Spencer :—"Worse is the danger hidden than descride." Moreover, seamen are fewer in number than formerly in proportion to tonnage, and about four years ago the Board of Trade, by means of a circular, drew attention to the indisputable fact that some sea-going steamers carry such scanty crews that watch and watch is barely possible on board of them. Mr. Justice Butt recently gave judicial utterance to the opinion that the practice of under-manning was decidedly on the increase. This contention was proved up to the hilt only last year, by a collision between the steamships *Lucinda* and *Garonne*, which happened one night while they were navigating the narrow waters of the Red Sea in opposite directions. The former vessel, an ocean tramp of over 1,000 tons, was making the best of her way home without a man on deck, save the officer on her bridge and her helmsman. The only available look-out man had been sent below to help keep the fires going, in place of a sick fireman. It is not an uncommon practice in small steamers for the officer of the watch to take the wheel, while his watch of two able-bodied seamen set such sail as he may desire. Several collisions have occurred in consequence. A walk through the docks of London or Liverpool will afford ocular demonstration, that some sailing-ships are working under similar conditions. Many a vessel, hitherto sailed as a full-rigged ship, is converted into a barque by the simple expedient of sending down her after-yards, and fewer men before the mast are carried. Nevertheless, no alteration is made in the spread of her canvas on fore and main, although she never had more cats than could catch mice. Again, four-masted ships are fast coming into vogue, and inasmuch as these leviathans are not so square-rigged as three-masted full-rigged ships of similar tonnage, it is found to be within the limits of possibility to decrease the number of able-bodied seamen carried. Hence the complement of any ship of given tonnage is diminished, whether her square-rigged masts be decreased or increased.

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We may fairly enumerate the causes of losses of ships concerning which inquiries have been held in our islands under nine heads: Neglect of the lead; Risky navigation; Collision; Erroneous inferences with respect to lights; Soundings; The effects of tides, currents, and leeway; Foundering; Missing; Explosion; Unknown rocks; and Stress of weather. Six sailers and 31 steamers were found to have ignored the use of the lead in over-confidence; 9 sailers and 24 steamers were navigated in a reckless manner, seeking too close shaving with headlands and outlying dangers; 26 ships were in collision, 12 of which were sailers; 5 sailers and 10 steamers were discomfited in consequence of mistaking lights they had sighted, the soundings obtained, or the set of tides, currents, and drift to leeward; 4 sailers and 4 steamers were abandoned dismasted, on fire, cargo shifted, or swamped by heavy seas; 1 steamer suffered from an explosion of coal-gas soon after leaving port; and 2 small sailers laden with petroleum spirit blew up, owing to the vapour of the cargo coming in contact with naked lights; the s.s. *Cotopaxi* struck on an unknown rock; and 1 sailer was damaged through stress of weather. Not one of these ships was alleged to be badly built, overladen, or undermanned. Black sheep will be found in every flock, and shipowners cannot claim any exception, but it avails little to revile shipowners in general for the faults of a few of their number. We should rather keep to moderation in all things; and, remembering the *auream mediocritatem* of Horace—

"Avoid extremes, and shun all such
Who praise too little or too much."

Thirty-three of the ships forming the subject of inquiries were laden with coal, 18 with various ores and metals, 17 with general cargoes, 13 with timber, 12 with grain, 8 with wool, 8 with nitrate, 8 with salt, 2 with petroleum spirit, 2 with phospate, 1 with ice, and 23 were in ballast. The ages of these vessels were as follows:—

Years old	0—9	10—19	20—29	30—39	40—49	50—59	Not stated.
Number of ships	52	43	16	5	2	2	10

Hence it will be seen that the greater number of these ill-fated vessels had not attained to that extreme old age which should be

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expected, having regard to Mr. Plimsoll's appeal. Some of the masters were let off with caution or censure. The average suspension of certificate was for three months, and the maximum period 12 months. It is satisfactory to note that in only two cases was disaster attributed to the drunkenness of master or officers.

THE REVENUE DEPARTMENTS.

(*Communicated.*)

IN the years 1877, 1878 and 1879, we gave a series of articles dealing with the British Custom House system; its history, functions, administration, and extraneous duties performed by its officials. In January, 1886, another related article was published dealing with the smuggling question. In the number of this magazine for May, 1879, the question of amalgamation with the Inland Revenue Department was freely gone into. This question—arising first with the Horsfall Committee of 1862-3—was threshed out; and it is somewhat singular to observe how the arguments, *pro* and *con.*, which have again been produced before the Ridley Commission, were elaborately discussed by us so many years ago. To those interested, we can only refer them to the issues of the years named. There is, however, one explanation needed as to the numbers given. In May, 1879, it was stated that there were employed:—For Customs, about 5,000; Inland Revenue, 5,500; and Post Office, 10,500. The two former were practically correct; but the Post Office figure was only for the Metropolitan established staff. As a matter of fact, there is an army of about 100,000 people controlled now by the Postmaster-General, half of whom are "on the establishment"; and the others—those who, in the provinces mainly, are hybrids—being employed as assistants, and having other businesses of their own. The Telegraph Staff is also included in the larger number. One of the arguments used against amalgamation was on account of the immense power to be given to the chairman of a united

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board of revenue over such a large body of men, and having the oversight of such an immense sum as the total taxation collected by the two departments. But it is seen at once that one-half of this argument is of doubtful force when the amalgamated staff of 10,000 is compared with tenfold that number under the Post Office.

On the 20th September, 1886, a Royal Commission was issued, "to inquire into the Civil Establishments of the different Offices of State at Home and Abroad," with power to report from time to time. On the 5th June last a third Report (C. 5748) was issued dealing with the question of the Customs and Inland Revenue Departments. The principal section is signed by the Chairman, Sir Matthew White Ridley, and ten other Commissioners, and it is therein stated that, "The evidence given before us does not justify us in drawing the inference that a scheme of amalgamation could be satisfactorily and economically worked out." But it is, nevertheless, recommended that the two Solicitorships attached to the departments should be merged in one; and that the office of Receiver-General should be ultimately abolished. These views are somewhat inconsistent, but they are the proverbial straw which shows how the wind is blowing, and it will evidently blow the departments together before long. Attached to the Report is a Rider, by Sir Charles Lewis and Mr. H. L. W. Lawson, which goes the whole length at once. The arguments traverse the Report altogether, and are very strong in favour of the junction taking place, on the grounds (1) of financial economy; (2) administrative efficiency; (3) commercial convenience. So far as the latter point is concerned, it is shown that all the trade witnesses appeared to be in favour of it, excepting one, and he on behalf of the tea merchants, only deprecated "the introduction of unskilled officers," a contingency that would never, probably, arise. The others were strongly the other way. Mr. Wills, indeed, for the tobacco trade, pointed out that "the divergence of Revenue laws enforced by two departments, as well as the difference in their interpretations of the Code and methods of analysis, are prejudicial to the interest of the trading community." He also asserted that there was no

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concerted action between the two Boards in following up smuggled tobacco.

It was shown, too, that some of the official witnesses (Customs collectors) who were against amalgamation were inconsistent because they admitted that it would be better, at ports where the warehouses were under both departments, for them to be under one head—of course, under the Customs. Moreover, it appears in reference to this point, that the recommendation of the Departmental Committee of 1880 had not been acted on entirely, for the warehouses (bonded) were still apart at the following ports:—

	Under Inland Revenue.	Under Customs.
Liverpool	2	107
London	23	73
Newcastle	14	16
Glasgow	26	22
Leith	11	49
Belfast	8	20
Cork	21	3
Dublin	70	13
Limerick	1	3
Total	176	306

This table is a convincing proof that such a division of work must increase the expense. There are other sound reasons given in the "Rider," and which are quite unanswerable. It will be observed that the position taken up by the "Report" is a negative one; but that of the "Rider" is positive, and strongly so. Both Mr. Gladstone and Mr. Childers were examined, and gave their testimony in favour of amalgamation. With such advocates it is surprising that any delay should take place at all.

The arguments for and against are very fairly summed up in the Report, pp. 8 and 9. The latter have been chiefly anticipated in our number for May, 1879. But there is one, *vide* p. 11, which, looked at from another point of view, and which does not seem to have been clearly brought before the Commission, tells in the opposite direction. This argument is founded on the *extraneous*

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duties to revenue performed by the Customs officers. The collection of agricultural returns is effected by the officers of the sister Service, but no such argument is adduced from that, although it is an "extraneous duty." The "extraneous duties" of the Customs are:—Ship's Registry; collection of Trinity light-dues; duties of shipping master and Receiver of Wreck; enrolment of Naval Reserve men; supervision at landing of cattle; supervision of explosives at landing; collection of trade statistics; and the enforcement of the Foreign Enlistment Act in time of war.

Now, so far as these duties are efficiently done at the present time, there could, and would be no difference in the event of amalgamation. Why should there be? But the Commission think otherwise. It is alleged that for those purposes an increase of staff would be required. The reason is not given. But *there is a reason.* It is a matter of public utility; and a serious matter it is. Not only is it so in the event named, but it is a question whether it should not be done at once, even under present circumstances. In August, October, and November last, the point regarding the Shipping Office business was fairly and fully discussed in this magazine. But the other divisions named above are of equal importance. The most of them are, primarily, Board of Trade matters, and, to do the work efficiently, ought to be done directly by Board of Trade staffs, under a strict disciplinary code. It has been clearly shown by the evidence of "Trade" witnesses, how necessary it is for the Officers of Revenue to be uniform in their action. In purely revenue matters, they should be "experts," and, as far as possible, confined to the collection of taxation. It is a big business—thought by some to be too big for one department. It is here where the trouble comes in. Parliament, to save expense, does not like to multiply departments. Hence, the Customs has often been saddled with these "extraneous" duties, as they were invented. It has only helped them to neglect their own proper duties; as instance the inefficient suppression of smuggling (instances given in these pages in January, 1886); but the "extraneous" duties were also scamped, as they always must be, by a staff not directly responsible to the department concerned for the strict performance of its work. That is, being done at second-hand,

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these "extraneous" duties are done in a perfunctory manner. In many cases, necessarily so owing to the small amount of money allowed for their performance. The result has been confusion; and curses loud and deep have been piled on the devoted head of the Board of Trade, even where its chiefs have been working hard, and anxiously trying to do the very best for the public. However, the question is forcing itself now. This "Report," though inadequate, is blindly showing us the way. The enormous increase of late years of our shipping interest, estimated at 120 millions capital and 30 millions annual net proceeds; the imports and exports, valued at 700 millions annually, to say nothing of half-a-million passengers carried yearly across the seas; the strained relations of the shipowners and their servants; the Plimsoll agitations, and such like political *émeutes*—all tend to show us that this question cannot be long postponed. It is a matter of life and death—a question of grave public concern and utility. If genuine statesmen are not soon found to grasp the situation firmly, the ulcer will burst, and it will require a very big bandage, indeed, and a tremendous amount of political salve to heal it.

The sooner, therefore, the Board of Trade, for its own sake, causes sufficient inquiry to be made, the better. There is a tremendous amount of irritation under the surface of things, and it is bound to break out seriously some day, perhaps soon. The course, as a whole, is plain enough, and has formerly been recommended in these pages. But what is wanted, particularly now, is to have such a thorough inquiry into *details* as to make out a clear estimate of cost, and readjustment of the work in its various branches, so as to be efficient, economical, and abreast of the times.

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A NEW RUSSIAN PORT IN THE BLACK SEA.

THE British Consul-General at Odessa, in a report which has just been published, describes Novorossisk, a port on the coast of the Northern Caucasus, which has been brought into notice since the opening of a branch railway connecting it with the main line from Rostoff to Vladikavkas, in the early part of last year. What was then an insignificant village has sprung up into a town of 8,000 inhabitants. The port is always open to navigation, and the railway company has been energetically pushing on the works for facilitating shipping operations. Two wooden piers have been constructed, alongside which vessels drawing 22 feet of water can load from trucks. On one pier a high-level railway has been made, so that grain can be shot direct into ships' holds. Warehouses capable of holding 65,000 tons of grain have been constructed, with rails leading to the piers, and by means of electric lights loading can be carried on at night. Steamers are thus able to clear with full cargoes in three days after arrival. A breakwater is being formed to afford protection from the southerly winds. The port dues, clearances, &c., amount only to £10 or £12 per steamer. In the first six months of the present year 70 steamers, independently of those engaged in the coasting trade, visited the port and cleared with grain cargoes; of these 46 were under the British flag. The declared value of the grain exported in that period was over £600,000. In addition to foreign shipping, 217 steamers and 148 sailing-vessels under the Russian flag called at the port in the same period. Besides grain, the chief exports are naphtha, refuse, and cement. Most of the land in the neighbourhood below the vegetable mould is formed of cement of remarkable purity, and only requires heating in furnaces and grinding to become the ordinary cement of commerce. There is an annual output of 14,800 tons, nearly the whole of which is taken up by Government at 70s. per ton. The Consul-General thinks Novorossisk has a great future. When the Azov is frozen in winter, the grain

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arrested at Rostoff will find its way to it. Moreover, in time the rich plains of the Northern Caucasus, which are now sparsely peopled on account of the wholesale emigration of the Caucasian inhabitants, will gradually be brought under the plough, and for these regions it is the natural outlet.—*The Times.*

CORRESPONDENCE.

THE WASHINGTON MARITIME CONFERENCE.

To the Editor of the "Nautical Magazine."

SIR,—As a constant reader, I am surprised to see the *Nautical Magazine* so far to leeward in the matter of the Maritime Conference at Washington. I have always felt that one great advantage in taking your magazine was that I got information on things nautical before other people; but now! I can get from other publications the *whole* of the amended Regulations for Preventing Collisions at Sea. I hope, in your next number, you will have some information to give us on the point. Your correspondent "Rex's" letter is *à propos* to the subject; but, I trust, for the poor seaman's sake, that *long* and *short* sounds will NEVER be adopted. If they are, and in an eight-point code, why, Lord have mercy on us on a dark night off Dungeness, that's all.

Yours, Sir, respectfully,

"NEPTUNE."

[We have purposely refrained from criticising the proceedings of the Maritime Conference while it was sitting, preferring to wait, as is our custom, for a full and authentic report of the whole proceedings before discussing the points in detail. Our correspondent talks of "the amended regulations," but no change is yet made, and we can assure him he need not be alarmed that any will be made without submitting the matter for full consideration by those affected. The gathering at Washington is only a Conference, not a law-making assembly.—ED. *N.M.*].

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THE CHANNEL BRIDGE.

To the Editor of the "Nautical Magazine."

SIR,—Will you kindly allow me to have a parting shot at the biggest fad of all fads in this very faddy generation—I mean the Channel Bridge.

Because some of our civil engineers have succeeded in constructing a very fine bridge over an arm of the sea in Scotland, they wish—possibly for the same reasons as most men who have to earn a living by their profession—to have something more wonderful to do, if not to increase their earnings, at least to employ their leisure, or "to put in time." Well, Sir, because their pet scheme of the Channel Bridge has not met with that amount of favourable attention they could have wished, and because certain objections have been made against making a narrow channel still more constricted and dangerous, they, or their colleagues, Messrs. Schneider and Hersent, now propose to surmount this difficulty by building harbours under the bridge, this is to say, by making some of the spaces enclosed between the piers into harbours—but for what purpose, is not very clear. Their ideas appear to be that if a ship cannot get through the bridge she will then have a harbour to go into. This grand solution of the difficulty reminds me of such a thing as tripping people up "for fun," and then establishing doctors on the spot to heal their broken shins. But there is another question in connection with the plan itself which I have never yet, so far, seen met. The main span is to be 1,640 feet long, and with such enormous length without any stays between piers, what is going to hold the whole structure from being blown away like a kite, during the first heavy storm from the south-west, or from that quarter which throws the wind at right angles to the bridge? The question, too, of corrosion is important. Mild steel corrodes very rapidly, and always in the vicinity of salt water, where thousands of saline particles must always find a lodgment. The cost of paint alone to keep such a structure free from corrosion and the labour of putting it on would, in my opinion, be nearly as much as the total cost of keeping up a tunnel. But, however much you lay on paint about iron and steel, you can never get it in effectively to those places where chafing

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is going on, and in a span of such length there must surely occur hundreds and thousands of such places where some slight rubbing is always in evidence. I see that the engineers reckon on such a bridge using up one million tons of steel, and at a total cost of 34 millions sterling. Call it 50 millions—allowing for an engineer's estimate being always over the ultimate amounts, and we then have an undertaking which, whether one looks at it commercially or mechanically, few but simpletons would ever care to take up stock in. I have the highest possible admiration for progress, but in the Channel Bridge affair I would draw the line and elect either for a tunnel or powerful train ferry boats.

I am, Sir, yours truly,

SHIPOWNER.

London, Dec. 16th, 1889.

FIREMEN IN THE RED SEA

To the Editor of the "Nautical Magazine."

Sir,—In my early days it was my fate to command an Arab ship trading from India to Jeddah carrying produce and pilgrims, the produce being principally rice, dholl, and other Eastern commodities. The pilgrims produced vast swarms of vermin, and necessitated a line of defence being thrown across the quarter-deck, drawn with pitch or tar, and therein many of the enemy perished, once within its borders. On the whole a trip to and from India in a sailing-ship with Arab officers and an Arab crew tries one's mettle and resources in many ways. The Red Sea is dangerous to navigate, and observations are not always reliable. An almost indistinct mirage may cause a serious error; the reefs are numerous, and in the forenoons, although only a few feet below the surface, are almost invisible, and on a quiet day are without a ripple on them. The Arabs prefer the afternoon for entering narrow channels into the harbours, because the shoals show a dark shadow during the afternoon. Shadows are not much to steer by, but sailors are thankful for small mercies, and many a time a meridian shadow on the disc of the palinurus would have been of service if it could have been obtained; but a vertical sun does not produce shadows, although it does produce heat, and a chair

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without a bottom is a luxury not to be despised when in a sitting posture, when the pitch is welling out of the seams of the deck, and the deck scorching the feet, and the atmosphere is laden with an overpowering and depressing heat, on deck and in saloon almost insufferable. What must the feeling and the effect then be in the stokehole, surrounded with furnaces that need constant attendance, in an atmosphere that almost extinguishes the fires from sheer lack of draught? I have seen and felt somewhat of the torment referred to, and felt inclined to get impatient at the slow progress of the steamer. The telegraph stands at full speed, while the panting engines denote half speed. Mount Horeb and Sinai do not look pleasant continuing so long on one bearing. A ring up on the telegraph is about to be resorted to, and placing the hand on the disc it is found almost impossible to touch it without being burned. Reflect, Skipper on the bridge, if things are so where you are, what must they be in the stoke-hole? No, I won't ring up, but pray that if only half speed can be kept up, bye and bye the Red Sea, and its red shores, and its red men will be left behind. The misery of such like torments leave their testimony behind them; to alleviate them as much as possible ships, men, and appliances should be all of the very best, and awnings fore and aft, of No. 1 canvas, are indispensable. The Solomons of the day suggest that ships, at certain seasons of the year, should be restricted to certain draughts of water. Well, there is a greater necessity in an Indian voyage, *viâ* the Red Sea, that steamers should in every respect be fully equipped for the voyage. When this is done there will be an end of the disgraceful scenes of mad men jumping overboard, which of late have been prominently before the public. All tramps will not become P. and O.'s in their ways, but official inspection should compel the tramp to comply with reasonable demands such as others adopt without compulsion.

Once upon a time, long, long ago, an afflicted Assyrian (Naaman) visited a far country to see a prophet who, it was said, could cure him of his leprosy. The prophet and the Assyrian met, but the cure suggested was so simple that the great man would not try it. Fortunately in his *retinue* there was a little faithful maid, and when she heard that her master had refused to dip in the Jordan

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and be healed, made way to press upon the proud man, and successfully pleaded with him to comply with the prophet's directions, and wound up her argument in persuasive eloquence, reminding her lord that if the Holy man had asked him to do some great thing then he would gladly have done it. The story has its moral; and the tramp type of owners are hereby asked to do as they would like to be done by, and, by so doing, help their faithful servants to serve them better, and save themselves from the leprosy of a condemning conscience when life's voyage draws to a close. Wishing you and your numerous readers a Merry Christmas and a Happy New Year.

AN OLD SAILOR.

Carnoustie, December 10th, 1889.

SHIPS' LIGHTS.

To the Editor of the "Nautical Magazine."

Sir, — I believe I am right in stating that the Committee appointed at the American Congress to consider the subject of steamers' lights advised, in their report, that the side-lights should be carried *abaft* the masthead light, and that the stern-light should be always carried. I also read that the Congress in full Committee rejected this scheme.

Now if this is so, is it not a great pity for one of the most important of their subjects of discussion to be thus shelved?

Many years ago Mr. Thomas Gray pointed out in his valuable book *The Rule of the Road*, that you could not, by her lights, tell how a steamer was heading within 10 points; and here is a scheme which will rectify this matter brought forward, advised by Special Committee and—passed over!

Some six months ago I was favoured with a sight of this idea, carefully worked out on paper, by a gentleman who used to command a steamer in one of our mail services, but who was also a coaster of some experience, and who is now in the Board of Trade. I was then greatly struck with the complete adaptability of the scheme, and was told it would probably be considered by the American Congress.

Sir, I think it will be too bad if this important item is passed over. For years in your magazine we have had scheme after scheme

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advanced for this purpose, and this very idea, which is the *only workable one* I have seen, should not be passed over.

The Congress has agreed that an after-light *may* be carried. If *may*, why not *must?*

Now, we North Country skippers may be rough, but we will yield the palm to no man in our knowledge of coasting; and always working in a heavy traffic as we are, there are no men afloat better able to give an opinion on such matters than ourselves, and I, as one of them, say that this subject should not be let slip, for since light towers on the forecastle-head came in vogue, we have no guide whatever as to how a steamer is steering. I think the alterations made in the regulations are good, but in this instance a great opportunity has, I think, been lost.

The proposed two masthead lights, one 20 feet above the other, will not answer, for from anywhere near ahead, the ship would show the towing signal which might lead to grave errors.

Sir, your obedient servant,

T. H.

Lacquer as a Preservative of Ships' Bottoms.—The Japanese newspapers publish an official report by the captain of the Russian frigate *Dimitri Donskoi* on lacquer as a preservative of ships' bottoms. In the latter part of October, 1887, the frigate put into the Yokosuka Docks for the purpose of having her bottom examined and cleaned. After the water had been drawn off, it was discovered that the entire steel line along her keel was so completely corroded that not a trace of paint could be discerned. The outer surface of the iron plates was found to be in a honeycombed condition, due to large numbers of shell-fish, and this was more particularly observable along the water-line. Acting on the advice of some Japanese engineers who were well acquainted with the action of the electric current generated by friction between he various kinds of metal used on ships, it was decided to adopt he lacquering process, which, although an invention of recent date,

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had already given satisfactory results. Not only the steel but also the zinc portions were lacquered. Though the lacquer was intended to minimize the action of the electric current on the zinc, its power of adhesion to the zinc sheathing was found to be very slight, and consequently its durability and preservative properties were greatly impaired. After the lapse of a month from the ship's departure from the dock, the lacquer completely peeled off the zinc sheathing, and in six months the rate of speed of the frigate became perceptibly lessened. In October, 1888, the frigate put into dock at Yokosuka a second time, and an examination revealed the fact that the lacquer on all the steel portion was in an extraordinarily good state of preservation, so much so that it could not be stripped off except by being scraped with a sharp-pointed instrument. The corrosion of the steel once removed, the lacquer possesses the property of preserving it in that state without being affected with corrosion itself. The general appearance of the corrosion presented, on observation, remarkable inequalities. One part may be badly corroded, while another may escape corrosion altogether. On scraping the foul part of the lacquer with a sharp instrument and removing all the varnish, the lacquer underneath was found to be still preserved in its original state and to be adhering strongly to the iron plates. The results of this lacquering as compared with that of the previous year were highly satisfactory, and it is therefore not too much to claim that the great efficacy of lacquering to counteract corrosion has been conclusively established. Taking the Japanese war-vessel *Ryojo Kan* as an illustration of the lacquer experiment, it is found that lacquering is sufficient to render the action of the electric current ineffective. The steel plates were therefore lacquered, and it was decided to substitute iron on the part where zinc had been used. Lacquering was first used on iron ships in Japan in 1885, after which the Government decided on getting all the bottoms of their iron ships lacquered, so that up to this the experiment has been tried scores of times and the efficiency of the process tested over and over again. The virtues of lacquer for this purpose have long been recognized in Japan; but the above is stated to be the first report on the subject from a foreign naval expert.—*The Times.*

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BOOKS RECEIVED.

Annual Report of the Hydrographer to the Bureau of Navigation for the Fiscal Year ending June 30th, 1889. Washington: Government Printing Office. 1889.

This is an instructive and well prepared publication. It shows what the American Hydrographer is enabled to do by Congress, and affords the means of comparing his work with what our Parliament allows the British Hydrographer to undertake. Chart construction and publication, sailing directions, marine meteorology, branch offices, derelicts, surveys, longitude, and magnetic investigations are among the chief subjects with which the American Department deals, while many smaller matters are also entrusted to its care. The following extract shows that the Department is justly proud of its work, and it also throws a little light on how the Washington Maritime Conference was got under way:—

"There can be no doubt that the publicity given to the subject of floating wrecks, fogs, and icebergs on the banks of Newfoundland, safe routes, &c., by the Pilot Chart and by the branch hydrographic offices has been the instigating cause of this Conference, although its consummation is undoubtedly due to Mr. Fras. W. Houghton, Superintendent of the New York Maritime Exchange, who started the movement through the New York Exchange last fall, and did much to influence Congress, following it up until the Act was signed."

A Handbook of Modern Explosives. By M. Eissler, Mining Engineer, &c., &c. London: Crosby, Lockwood, and Co. 1890.

For many years the subject of explosives has been regarded by the public with fear and trembling. Even those whose business made it necessary for them to use such destructive agents have done so without knowing much about the compounds employed, and have entirely trusted the manufacturers to provide for them an article which will serve their purpose without any very serious risk. The

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fact is, the literature of the subject in this country is extremely scanty, and what there is can only be found by hunting up papers read at learned societies by Sir Frederick Abel and others. Therefore, there is plenty of room for such a book as the one now before us, especially as it is carefully and completely prepared. The handbook will, of course, be of most service to the mining and quarrying communities. Explosives are more used in their operations than in any other business, and if any of our readers are interested in such operations, we strongly advise them to get a copy of Mr. Eissler's book, for they will find it a most serviceable work. The author describes fully all the various kinds of explosives in the market, showing how they are made, what is their relative value in respect of force exerted and suitability for different kinds of work, their comparative merits as regards safety in handling and storage, the restrictions in their conveyance, &c., &c. From a nautical point of view, the subject of explosives does not seem to be of much interest; but shipmasters who may be required to carry such things as cargo will do well to avail themselves of the information given by Mr. Eissler respecting the nature and relative safety of the various compounds. For the dispersal of obstructions to navigation there must be a considerable quantity of explosive employed, and the observations of the author respecting the shattering effect of one kind of explosive, and the rending action of another, may possibly enlighten those engaged in such work. We notice that Mr. Eissler says nothing about the sound-producing power of the explosives when detonated in free air; but as many of our sound-signals on the coast, and some of the distress-signals used in case of need on board ships at sea, are produced by the detonation of tonite charges, it might have been interesting if this matter had been referred to. But the book is, on the whole, a very good one, and will probably run soon to a second edition, when Mr. Eissler will have an opportunity of saying something about the use of explosives as sound-signals.

Pilot Chart of the North Atlantic Ocean for December.

This chart contains hints and directions as to the style of observation required from commanders relative to the total eclipse of

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the sun on December 22nd. It also contains an interesting statement respecting the drift of the mid-channel buoy from Port Royal, S.C., which went adrift in the latter part of November, 1886, and is still floating about in the North Atlantic, probably somewhere between the parallels of 35° and 45° N. and the meridians of 45° and 55° W.] The last position in which the buoy was seen is about 1,560 miles E. by N. from Port Royal. The total time afloat is about two years and nine months, and the total drift, as indicated by reports to hand, is about 2,170 miles. The report seems to show that some length of the mooring-chain is still attached to it, in which case the immersion is probably so great that the influence of the current largely outweighs that of the winds, and the drift of the buoy is a very fair indicator of the set of the current it has experienced. The chart mentions the removal of two dangerous derelicts. The American schooner, *David W. Hunt*, to which we referred in our article on "Derelicts" last month, and the Portuguese barque *Nobreza*, abandoned during the St. Thomas-Hatteras hurricane, on September 11, 1889, in latitude 29° 42′ N., longitude 66° 45′ W., the wreck being found on November 7, 1889, about 50 miles S.E. of Bermuda, and towed into St. George's Harbour. Between the above dates she was reported eleven times. The chart for December shows numerous derelicts to be afloat out in the Atlantic, and it is only too evident that they must constitute a very important factor in the ordinary risk of a trans-Atlantic passage.

Annual Report of the Chief Signal Officer of the United States Army for the Year 1889.

The meteorological part of the report shows very satisfactory work to have been done. Weather forecasts are issued daily at 8 a.m. and 8 p.m., for a period of twenty-four hours. The percentages of success for the year ending June 30th, are for weather, 84·4; temperature, 75·8; with a general average of 81·0. During the year, 1,066 storms signals of all kinds were ordered, of which 680 were wholly and 74 partly justified as to velocity, and 980 justified as to direction. The present system of signals, adopted two years since, is said to be most advantageous and satisfactory,

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as it gives clear and definite information. By the use of two flags and two pennants, the general public are informed whether the storm is to be light or severe, whether its centre is approaching or has finally passed the station, and from what quarter high winds are expected. The yellow cautionary signals indicate winds which it is believed will be dangerous to light craft or ill-provided vessels, while the red storm flag indicates the more dangerous and violent gales. The percentage of successful predictions has risen steadily from 78·3 in 1887 to 81·6 in 1888, and 83·8 in 1889. The number of points supplied with telegraphic forecasts and warnings at Government expense, was 1,056 at the end of the year. The report states that charts have been completed which show the number of cyclonic storms that have been traced through each square of 5° during the ten years, 1878 to 1887, and these charts indicate the most frequent direction of storms over the several countries and oceans of the Northern Hemisphere. The charts will be published together with a small amount of text showing the general deductions drawn from the observations.

Almanack der Kriegs-Flotten. 1890. Vienna.

THE admirable pocket-book, *Almanack für die k.k. Kriegs Marine*, published at Pola, has achieved a world-wide reputation for its comprehensive and accurate information regarding the war-ships of the world. This year that part of it which is of universal interest, is separated from the part relating to the personal and domestic naval affairs of Austria, and is published under the title given above. The opportunity afforded by the saving of space thus effected, has been utilised by the insertion of a large number of sketches in profile and plan of the ironclads of various nations, showing the distribution of their armour and armament. The full information on the naval war material of all nations for which previous issues of this valuable annual have been distinguished, is brought up to date in the number before us.

We have before us the sixth number of our new and vigorous contemporary, *The Steamship: A Scientific Journal of Marine Engineering, Shipbuilding and Shipping*, published and edited by Mr. John Lockie, C.E. (Whitworth Scholar), and published at

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Leith. We are glad to welcome such a valuable addition to the current literature of the mercantile marine. Considering the great importance of our shipping interests, the periodical literature specially devoted to them is even now relatively small. *The Steamship* contains valuable serial papers upon Mechanical Refrigeration and Electric Lighting, and in the number before us are articles upon Broken Shafts, the Coaling of Steamships, the Pamphlett-Ferguson Distilling Apparatus, &c., besides much miscellaneous information.

The Fisherman's Nautical Almanac, Tide Tables, and Smack List, for 1890. Compiled by O. T. Olsen.

This Almanac, with its usual abundance of information for fishermen, maintains its accuracy in noting the various changes in lights and buoys on the coasts and the different channels since the previous publication.

The East Coast of South America from Cape Orange to Cape Virgins, including Falkland, South Georgia, Sandwich, and South Shetland Islands. Compiled by Lieut. J. C. Fremont, U.S.N., and R. H. Orr, U.S. Hydrographic Office. 1889.

These sailing directions, No. 88 of the publications of the United States Hydrographic Office, appear to have been carefully compiled from all the various sources of information necessary for an accurate work of the kind, viz., the Archives of the U.S. Hydrographic Office; the Office of Naval Intelligence, Bureau of Navigation; *South America Pilot,* Part I., Admiralty; Port Charges of the World, Hunter and Patten; Consular Reports, State Department; and Dock Book (Admiralty). Under three general heads, each of several chapters, it includes (1) the coast and harbours from Cape Orange to Cape St. Roque; (2) the coasts and harbours between Cape St. Roque and Cape San Antonio; and (3) Cape San Antonio to Cape Virgins, including islands in the South Atlantic. Each part commences with general remarks on the wind, weather, tides, currents, &c., of the particular locality, after which come a general description of the coast, harbours, rivers, and all the

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necessary instructions to assist the navigator. It is worthy of remark that the bearings, courses, and trend of the land are *true*, not magnetic. A list of the special charts included within the limits of the work, a suitably arranged list of lights, together with a list of places that offer coaling and repairing facilities, are given in the publication, altogether a well-arranged and excellent book of directions.

In addition to the works specially noticed we have during the past year been in regular receipt of the following periodical publications, which we now acknowledge with thanks :—

Annales Hydrographiques (Paris), *Revue Maritime et Coloniale* (Paris), *Bulletin de la Société de Geographie de l'Est* (Paris), *Rivista Marittima* (Rome), *Revista General de Marina* (Madrid), *Boletin de la Sociedad Geografica de Madrid*, *Revista Maritima Brazileira* (Rio de Janeiro), *Revista de la Association de Navieros* (Barcelona), *Mittheilungen aus dem Gebiete des Seewesens* (Pola), *Meteorologische Zeitschrift* (Berlin), *Entscheidungen des Ober-Seeamts und der Seeamter des Deutschen Reichs*, (Hamburgh, 1889), *Railroad and Engineering Journal* (New York), *United Service* (New York), *Pilot Chart of North Atlantic* (New York), *Le Yacht* (Paris), *Das Handels Museum* (Vienna), *Das Schiff* (Dresden), *Hansa* (Hamburg), *New York Maritime Register*, *Maritime Journal* (New York), *Seaboard* (New York), *Forest and Stream* (New York), *Scientific American* (New York), *Notices to Mariners from all Parts of the World*, *The Publications of the Meteorological Office* (London), *Mercantile Marine Reporter* (Liverpool), *The Steamship* (Leith), *Shipwrecked Mariners' Magazine* (London).

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TIDE TABLES FOR JANUARY, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	LONDON BRIDGE.		HULL.		NORTH SHIELDS.		LEITH.		DEVONPORT.		DOVER.		WESTON-SUPER-MARE.		LIVERPOOL.		GREENOCK.		QUEENSTOWN.		KINGSTOWN.		LONDONDERRY.		BREST.	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
W	1	10 10	10 43	2 30	3 0	—	0 7	11 0	11 29	1 24	1 57	7 6	7 38	2 27	3 1	7 35	8 6	8 5	8 37	0 52	1 25	7 21	7 51	4 34	4 58	—	0 25
Th	2	11 15	11 46	3 30	4 0	0 36	1 8	11 57	—	2 28	2 57	8 9	8 38	3 35	4 7	8 34	9 0	9 7	9 35	1 57	2 26	9 14	9 43	5 21	5 43	0 55	1 23
F	3	—	0 13	4 27	4 51	1 28	1 50	0 22	0 44	3 25	3 50	9 4	9 27	4 37	5 4	9 24	9 46	10 1	10 25	2 53	3 18	9 14	9 38	6 4	6 25	1 48	2 10
S	4	0 39	1 2	5 12	5 32	2 11	2 31	1 5	1 26	4 15	4 38	9 50	10 12	5 29	5 53	10 6	10 26	10 47	11 9	3 41	4 3	10 0	10 20	6 46	7 7	2 31	2 51
S	5	1 25	1 45	5 52	6 12	2 50	3 9	1 46	2 6	4 59	5 20	10 33	10 54	6 16	6 37	10 45	11 4	11 30	11 51	4 24	4 44	10 38	10 56	7 28	7 48	3 11	3 30
M	6	2 6	2 23	6 32	6 51	3 27	3 45	2 25	2 43	5 39	5 57	11 14	11 34	6 57	7 16	11 23	11 41	—	0 11	5 3	5 22	11 13	11 30	8 6	8 22	3 48	4 6
Tu	7	2 39	2 57	7 10	7 28	4 3	4 21	3 0	3 16	6 15	6 33	11 54	—	7 34	7 52	11 59	—	0 30	0 48	5 40	5 58	11 47	—	8 38	8 54	4 24	4 41
W	8	3 14	3 32	7 46	8 3	4 38	4 55	3 32	3 49	6 50	7 5	0 13	0 32	8 9	8 25	0 17	0 34	1 6	1 24	6 16	6 33	0 4	0 22	9 10	9 25	4 58	5 15
Th	9	3 48	4 5	8 19	8 35	5 12	5 29	4 6	4 24	7 20	7 35	0 50	1 8	8 40	8 55	0 51	1 8	1 41	1 57	6 50	7 7	0 40	0 58	9 41	9 57	5 32	5 48
F	10	4 22	4 39	8 53	9 11	5 47	6 6	4 42	5 0	7 51	8 8	1 27	1 46	9 11	9 27	1 25	1 42	2 14	2 32	7 25	7 43	1 16	1 35	10 14	10 32	6 6	6 24
S	11	4 56	5 13	9 30	9 49	6 25	6 44	5 19	5 39	8 25	8 42	2 5	2 24	9 43	10 0	2 0	2 18	2 50	3 8	8 1	8 19	1 54	2 14	10 51	11 13	6 42	7 1
S	12	5 32	5 50	10 8	10 28	7 4	7 25	6 0	6 22	9 1	9 21	2 43	3 3	10 17	10 34	2 37	2 56	3 26	3 45	8 37	8 56	2 34	2 55	11 38	—	7 22	7 44
M	13	6 11	6 32	10 50	11 15	7 49	8 14	6 46	7 9	9 42	10 5	3 24	3 45	10 53	11 13	3 17	3 39	4 6	4 28	9 16	9 38	3 17	3 40	0 6	0 37	8 6	8 29
Tu	14	6 56	7 22	11 43	—	8 41	9 10	7 35	8 4	10 30	10 57	4 6	4 29	11 35	—	4 2	4 29	4 50	5 14	10 1	10 27	4 5	4 34	1 9	1 43	8 54	9 22
W	15	7 47	8 17	0 14	0 45	9 42	10 17	8 36	9 10	11 27	—	4 54	5 22	0 2	0 33	5 0	5 34	5 42	6 18	10 58	11 32	5 5	5 37	2 19	2 55	9 54	10 30
Th	16	8 49	9 23	1 17	1 49	10 52	11 27	9 46	10 21	0 1	0 39	5 52	6 24	1 7	1 43	6 12	6 51	6 47	7 22	—	0 8	6 9	6 42	3 29	4 1	11 8	11 46
F	17	10 1	10 37	2 22	2 55	—	0 1	10 54	11 26	1 17	1 56	6 59	7 36	2 20	2 58	7 28	8 2	7 58	8 34	0 44	1 21	7 15	7 48	4 30	4 57	—	0 22
S	18	11 12	11 48	3 28	4 1	0 33	1 8	11 58	—	2 32	3 7	8 11	8 45	3 36	4 14	8 35	9 6	9 9	9 43	1 58	2 34	8 21	8 54	5 23	5 49	0 56	1 29
S	19	—	0 20	4 33	5 2	1 33	2 1	0 28	0 55	3 40	4 11	9 16	9 46	4 50	5 24	9 35	10 2	10 14	10 48	3 6	3 36	9 26	9 55	6 15	6 42	1 59	2 26
M	20	0 50	1 18	5 29	5 56	2 27	2 52	1 22	1 48	4 41	5 10	10 15	10 44	5 55	6 25	10 28	10 54	11 12	11 40	4 5	4 33	10 20	10 45	7 9	7 36	2 58	3 19
Tu	21	1 46	2 12	6 23	6 49	3 17	3 42	2 14	2 39	5 38	6 5	11 12	11 40	6 54	7 21	11 20	11 46	—	0 8	5 0	5 27	11 10	11 35	8 2	8 27	3 45	4 11
W	22	2 37	3 3	7 15	7 41	4 7	4 32	3 4	3 28	6 32	6 57	—	0 8	7 47	8 11	—	0 12	0 35	1 2	5 54	6 20	—	noon	8 51	9 18	4 37	5 1
Th	23	3 27	3 52	8 5	8 29	4 57	5 21	3 52	4 16	7 21	7 44	0 35	1 1	8 34	8 56	0 37	1 1	1 27	1 50	6 44	7 7	0 25	0 50	9 35	9 57	5 24	5 47
F	24	4 15	4 38	8 52	9 15	5 45	6 9	4 40	5 4	8 7	8 29	1 26	1 50	9 18	9 39	1 24	1 47	2 18	2 36	7 30	7 52	1 15	1 39	10 19	10 41	6 10	6 33
S	25	5 1	5 25	9 38	10 1	6 33	6 56	5 28	5 52	8 50	9 9	2 14	2 37	9 58	10 16	2 9	2 31	2 58	3 20	8 13	8 32	2 3	2 27	11 4	11 20	6 55	7 17
S	26	5 46	6 7	10 23	10 45	7 19	7 42	6 16	6 39	9 28	9 48	2 59	3 19	10 33	10 50	2 52	3 13	3 41	4 1	8 52	9 12	2 50	3 12	11 56	—	7 39	8 1
M	27	6 30	6 52	11 8	11 35	8 7	8 34	7 3	7 28	10 9	10 30	3 40	4 2	11 8	11 29	3 34	3 56	4 23	4 45	9 33	9 54	3 34	3 59	0 25	0 57	8 23	8 47
Tu	28	7 14	7 40	—	0 5	9 2	9 32	7 56	8 26	10 53	11 18	4 24	4 47	11 53	—	4 21	4 49	5 8	5 33	10 18	10 46	4 26	4 55	1 31	2 6	9 12	9 42
W	29	8 7	8 35	0 35	1 6	10 5	10 40	8 58	9 33	11 47	—	5 12	5 41	0 22	0 54	5 21	5 58	6 2	6 35	11 20	11 55	5 26	5 58	2 42	3 17	10 17	10 55
Th	30	9 9	9 47	1 38	2 11	11 15	11 50	10 8	10 43	0 20	0 56	6 18	6 48	1 30	2 8	6 37	7 16	7 10	7 47	—	0 32	6 31	7 5	3 50	4 21	11 33	—
F	31	10 25	11 5	2 44	3 18	—	0 25	11 18	11 51	1 32	2 7	7 26	8 5	2 47	3 26	7 54	8 29	8 25	9 1	1 10	1 48	7 40	8 14	4 51	5 20	0 11	0 48

TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* — *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−3 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 13	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+3 3	Brest
Boulogne	+0 13	Dover
Bridport	+0 22	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadiz	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 37	Dover
Campbellton	−0 23	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bar	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 37	Londonderry
Coquet Road	−0 23	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 56	Dover
Exmouth	+0 38	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 12	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 58	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 53	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 3	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 43	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 18	Devonport
Peterhead	−1 43	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 33	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 22	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 3	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 22	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+2 20	Queenstown
Whitby	+0 22	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 43	London
Youghall	+0 13	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt. = Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
1	England—Thames Entrance — Duke of Edinburgh Chan. —Tongue and Princes Chan.	New lights; changes of lights and buoyage.
2	„ „ N.E. Maplin and Colne River	Buoys altered in position.
3	„ East Coast — Covehithe Chan. and Caister Sand	Alteration in buoyage.
4	„ West Coast—Cardigan Bay	Information concerning shoals.
5	Scotland—Firth of Forth—Fisherrow	Harbour light re-exhibited.
6	North Sea—Belgium—Ostende	Light-buoy and alterations.
7	„ Netherlands — Goeree Is. — Jan Paulus	Visibility of light altered.
8	„ Germany — Elbe River — Cuxhaven	Additional semaphore.
9	Baltic Entrance—Kattegat — Aarhuus Bay	Light altered.
10	„ „ Lilla Warholmen	New leading lights.
11	„ „ Frederikshavn	Harbour lights altered.
12	Baltic — Gulf of Finland — Hangö — Hangöstad	Leading lights discontinued.
13	„ „ Hangö Road	Particulars of shoals.
14	„ Gulf of Bothnia—Storkallegrund	Temporary withdrawal of light-vessel.
15	Norway—West Coast—Biörö Cluster—Ræköen	New light.
16	Spain—Cape Finisterre	New fog-signal.
17	Portugal—Milfontes	New harbour light.
18	Mediterranean—Balearic Is. and Spain	Information on certain lights.
19	„ Capraia Is. — Mount Arpagna	New semaphore.
20	„ Linosa	New light in April, 1890.
21	„ Ionian Sea—Greece—Guardiana Is.	Discontinued for new apparatus.
22	„ „ Greece—Cerigo Is.—Kapsali Bay	Discontinued for new apparatus.
23	„ Suez Canal—Port Saïd —West Breakwater	Permanent light re-exhibited.
24	Black Sea—Krimea—Cape Tarken	Fog-signal re-established.

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MONTHLY ABSTRACT OF NAUTICAL NOTICES—*Continued.*

No.	PLACE.	SUBJECT.
25	AFRICA—West Coast—Nova Redonda	New light.
26	INDIAN OCEAN — Seychelles — Mahé Is.—Port Victoria	Buoyage, lights, beacons.
27	ARABIAN SEA — Nine Degrees Chan.—Minikoi Is.	Unsuccessful search for reported reef.
28	INDIA — West Coast — Gulf of Cutch—Mandvi	Temporary discontinuance of light.
29	EASTERN ARCHIPELAGO — Java Sea — Bavean Is.	Non-existence of rocks.
30	„ „ Java Sea—Le Bœuf, Arrogant and Oosterling Reefs	Particulars, &c.
31	JAPAN—Kiusiu—N.W. Coast	Various rocks.
32	„ Simonoseki Strait—Narusi Rock	New light.
33	SEA OF JAPAN—Waywoda Rock	Does not exist.
34	AUSTRALIA—East Cst.—Pioneer River—Round Top Is.	Sunken rock.
35	„ South Cst.—Port Phillip—Swan Is., &c.	Submarine telegraph.
36	TASMANIA—Bass and Banks Straits	Colour of lighthouses altered.
37	NORTH PACIFIC—Palmyra Is. (East side)	Extension of reef.
38	NORTH AMERICA—U.S. Pacific Cst.—San Francisco	Bell-buoy and fog-signal.
39	SOUTH AMERICA — Chile — Patagonian Channels	Beacons and buoys.
40	„ „ Rio de la Plata—Chico Bank	Position of light-vessel.
41	WEST INDIES—Puerto Rico—Port Ponce	Harbour light discontinued.
42	UNITED STATES—Mississippi—Pascagoula River	Rear range light changed in colour.
43	„ „ Maryland—Chesapeake Bay—Holland Is. Bar	New light and fog-signal.
44	„ „ New York — Princess Bay and Fort Tompkins	Lights to be altered in character.
45	„ „ „ Execution Rocks	Sector of red light.
46	BAY OF FUNDY—Annapolis	New light.
47	NEWFOUNDLAND—Strait of Belle Isle—Cape Norman	Delay in establishing fog-signal.
48	LABRADOR—Strait of Belle Isle—Greenly Island	Interval of fog-horn blasts altered.

NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

1.—ENGLAND.—*Thames Entrances.—Duke of Edinburgh Channel. —Tongue and Princes Channel Light-Vessels, Buoyage Changes, &c.,* —In accordance with notices in 1889, relative to the lighting of the Duke of Edinburgh channel, the establishment of new lights, &c., and changes in the positions of existing ones, these changes

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would be carried into effect, weather and other unforeseen circumstances permitting, on the night of the 18th December, 1889.

(1.) The *Tongue Light-Vessel* will be moved about two miles to the eastward, and the present Tongue Knoll buoy discontinued.

(2.) The *Princes Channel Light-Vessel* will be moved about two miles to the eastward, and the present Shingles spit buoy discontinued.

(3.) A bell buoy, which will also exhibit an *occulting gas light*, will be substituted for the present S.E. Girdler buoy.

(4.) A light-vessel, to be called *Edinburgh Channel*, which will exhibit *one white flash every five seconds*, will be placed near the position of the existing S.W. Longsand buoy, which will thereupon be discontinued.

(5.) A light-vessel, to be called *Black Deep*, which will exhibit a *group flashing white light* consisting of *four quick flashes every thirty seconds*, will be placed about midway between the West Longsand and East Knock John buoys.

(6.) Gas buoys, showing occulting lights, will be substituted for the present N.E. Shingles, Knock John, and Knob buoys.

(7.) A new spherical buoy, painted in red and white horizontal bands, and surmounted with a staff and diamond, and named *East Girdler*, will be placed about two cables N. by E. ½ E. of the *present* position of the Princes channel light-vessel.

(8.) The positions of the undermentioned buoys will be changed as follows:—Girdler Spit will be moved N.W. ½ W., 2⅔ cables; West Mid Shingles will be moved W. ½ S., 4 cables; North Shingles will be moved S.W. by W. ½ W., 2½ cables; N.E. Shingles will be moved N.W. by W. ½ W., 1¾ cable; Shingles Patch, No. 3, will be moved S. by E. ½ E., 1½ cable; Shingles Patch, No. 1, will be moved N.W. ½ N., 1 cable; East Shingles will be moved S.W. ½ W., 5 cables. The East Tongue will be surmounted with a staff and diamond.—Further details as to the exact positions of these lights, &c., will be given when the changes have been made.

2.—ENGLAND.—*Thames Entrances.—N.E. Maplin Buoy and Colne River Bar Buoy.*—The N.E. Maplin buoy has been moved 3 cables N.E. ⅜ N. of its former position, and now lies in 19 feet L.W. spring tides, with the following marks and bearings, viz.:—

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The high tower at Clacton, in line with the Whitaker beacon, N.N.E. ½ E. Ely.; Foulness mill, twice its width open south of a single house near the beach, well southward of Foulness church, W. by N.; Swin middle light-vessel, N.E. ¾ N., distant $1\frac{6}{10}$ths mile; N.E. Barrows buoy, S.E. ¾ E., distant $1\frac{3}{10}$ths mile; East Maplin buoy, S.W. by S. Sly., distant $1\frac{5}{10}$ths mile.

The bar buoy, entrance to river Colne, has been moved half a cable W.N.W. of its former position, and now lies in 5½ fathoms L.W. spring tides, with the following marks and bearings, viz.:—Brightlingsea mill (white) open eastward of No. 2 Martello tower, and midway between it and the western beacon on Colne point, N. by E.; No. 5 Martello tower full half its breadth open south of No. 4 Martello tower at Eastness, bearing E. by N. ½ N. Nly.; North eagle buoy, E. ½ S., distant $9\frac{9}{10}$ths of a mile; Knowl buoy, S.E. by S. ¼ S., distant $1\frac{3}{10}$ths mile; N.W. Knowl buoy, W. by S. ½ S., distant $\frac{8}{10}$ths of a mile.

3.—ENGLAND.—*East Coast.—Covehithe Channel and Caister Sand.*—In accordance with notice in 1889, the following alterations in the buoyage of the Covehithe channel have now been made:—

(1.) *Inner Barnard Buoy* has been discontinued.

(2.) *South Barnard Buoy* has been moved S.W. by W. ½ W., 6 cables, and is mounted with a staff and globe. It lies in 5½ fathoms L.W. spring tides, with the following marks and bearings:—Walberswick church, its apparent height westward of the new water works tower at Southwold, S.W. by W. ½ W.; the coastguard flagstaff at Covehithe, in line with a large barn, N.W. ½ W.; S.E. Barnard buoy, N.E. ¾ E., distant $1\frac{1}{10}$th mile; S.W. Barnard buoy, N.N.E. ½ E., distant $\frac{4}{10}$ of a mile; Covehithe buoy, N. by E. ½ E., distant ¾ of a mile.

(3.) *S.W. Barnard Buoy* has been moved E. ¼ N., 4 cables. It lies in 12 feet L.W. spring tides. Kessingland church, in line with the easternmost telegraph beacon, near the lifeboat house, North Wly.; Covehithe church in line with the south side of the coastguard cottages at Covehitheness, W. by N. Nly.; South Barnard buoy, S.S.W. ½ W., distant $\frac{4}{10}$ths of a mile; Covehithe buoy N. ¼ E., distant $\frac{3}{10}$ths of a mile; West Barnard buoy, N.N.E. Ely., distant $1\frac{4}{10}$ths mile.

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(4.) *S.E. Barnard Buoy* has been moved S.W. by W. 2¼ cables. It lies in 6 fathoms L.W. spring tides, with the following marks and bearings:—Kessingland church, twice its length southward of a house on the cliff; southward of Kessingland fish houses, N. by W. ¾ W.; the easternmost telegraph beacon in line with the south side of the lifeboat house, N.W. ¼ W.; East Barnard buoy, N.E. ⅜ N., distant 1 3/10 ths mile; South Barnard buoy, S.W. ¾ W., distant 1 1/10 th mile.

(5.) *West Barnard Buoy* has been moved east 1¼ cable. It lies in 4¼ fathoms L.W. spring tides, with the following marks and bearings:—Kessingland church, in line with the southernmost of two houses; southward of Kessingland fish houses, N.N.W. ¾ W.; Benacre church open northward of a flagstaff northward of Benacre sluice, W.N.W. Nly.; S.W. Barnard buoy, S.S.W. Wly., distant 1 4/10 ths mile; Covehithe buoy, S.S.W. ¼ W., distant 1 1/10 th mile; South Newcome buoy, N.N.E. ¾ E., distant 1 mile.

Also, the following alteration in the position of the buoys marking the *Caister Sand* has been made:—

(6.) *North Caister Buoy* has been moved N.N.E. 2 cables. It lies in 13 fathoms, L.W. spring tides, with the following marks and bearings:—Lacon's brewery chimney open westward of the mill on Yarmouth north Denes, S.W. ¾ S.; the waterworks syphon at Caister, its length southward of a red tiled barn, S.W. by W. ¾ W.; S.E. Cockle buoy, North, Wly., distant 7/10 ths of a mile; N.E. Cockle buoy, N. ¾ E., distant 1 7/10 ths mile; Scroby Elbow buoy, S. ⅜ W., distant 8 5/10 ths miles; Middle Caister buoy, S.S.W. Sly., distant 9/10 ths of a mile.

(7.) *Caister Elbow Buoy* has been moved N. by W. 1¼ cable, and is now named *Middle Caister*. It lies in 8 fathoms L.W. spring tides, with the following marks and bearings:—Nelson's Monument, the width of its base open eastward of the Britannia pier-head at Yarmouth, S.S.W. ¼ W. Wly.; Winterton Mill, in line with Hemsby Gap, N.N.W. Wly.; North Caister buoy, N.N.E., distant 9/10 ths of a mile; N.W. Scroby buoy N.E. by N. Ely., distant 1¼ mile; Caister Elbow buoy, S.S.W. Wly. distant 8/10 ths of a mile.

(8.) The buoy hitherto known as the Middle Caister is now named *Caister Elbow*.

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4.—ENGLAND.—*West Coast.—Cardigan Bay.—Information Concerning Certain Shoals, &c.*—Information concerning certain shoals, and existence of rocky ground, in the N.W. part of Cardigan bay—the result of recent examination of the locality—has been received from Staff-Commander W. E. Archdeacon, R.N., in charge of West Coast of England survey :—

(1.) *Bastram Shoal.*—A depth of 8¼ fathoms exists on the southern part of the shoal, where 4¼ fathoms has heretofore been shown. Position, lat. 52° 42½′ N., long. 4° 46½′ W.

(2.) A rocky ridge (*Ship ledge*) was found about 2½ cables south-eastward of the S.E. extreme of Bardsey island. This ledge extends nearly 5 cables in a N. by E. and S. by W. direction, with a breadth of about 1 cable, the depths on it varying from 5¾ to 7 fathoms, with 14 and 15 fathoms around. From the shoalest spot (5¾ fathoms), near the centre, the N.E. extreme of Bardsey island bears N. by E. ½ E., distant 9 cables, and Bardsey island lighthouse W. by N. ½ N., distant 7½ cables.

(3.) *Devil Ridge.*—A depth of 4¾ fathoms was found on this ridge, with Bardsey island lighthouse bearing W. by N. ½ N., distant 4¾ miles, and summit of Ynys Gwylan large islet N. ½ W., distant 2 miles.

(4.) A rock (*Passage rock*) with a depth of 3 fathoms, and 6 fathoms close around, lies midway between Ynys Gwylan large islet and The Trwyn; its position is well defined by the tide rip, and it blocks the channel except for small vessels.

(5.) A narrow ridge of rock (*Devil Tail*) with a depth of 14 fathoms throughout, extends in a N.E. and S.W. direction for a distance of about 5 miles. From its northern end, St. Tudwall lighthouse bears E.N.E., distant 10½ miles, and Bardsey island lighthouse N.N.W. ¼ W., distant 6 miles; and from its southern end, Bardsey island lighthouse bears N. ½ E., distant 8¾ miles, and St. Tudwall lighthouse N.E. by E. ½ E., distant 15 miles. Within half a cable on each side of this ridge, the depth increases to 22 fathoms, causing during the strength of the tide and bad weather, a heavy race, which small vessels should avoid. The depths given are at L.W. spring tides. *Variation*, 20° *W.*

5.—SCOTLAND.—*East Coast.—Firth of Forth.—Fisherrow.*—

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Harbour Light Re-Exhibited.—With reference to notice in 1889, on the destruction of the harbour light and a portion of the East pier at Fisherrow, the necessary repairs having been completed, the light (*fixed red*) is re-exhibited. Position, lat. 55° 56′ 50″ N., long. 3° 4′ 0″ W.

6.—North Sea.—*Belgium.—Ostende.—Intended Light-Buoy at Entrance, and Alterations in Harbour Lights.*—By notice, dated 9th November, 1889, a light-buoy, showing a *fixed white* light, is about to be placed about 33 yards seaward of the old West harbour pier-head at Ostende; and on the same date the two *white* lights indicating the works at the West pier would be discontinued. Two *red* lights placed horizontally and near each other, are shown from the East pier.

Note.—Entering the harbour, the light-buoy must be left on the starboard hand, and vessels should keep eastward of the line joining the principal light (fixed white) and the two red lights on the East pier, till abreast the battery near that pier.

7.—North Sea.—*Netherlands.—Goeree Island.—Jan Paulus (Flauwe Werk) Light.—Alteration in Arc of Visibility.*—The following alteration has been made in the arc of visibility of Jan Paulus (Flauwe Werk) light, N.W. coast of Goeree island. The light, *fixed white*, is visible from the bearing of S. ¼ E., through south, to S.W. ¼ W. Position, lat. 51° 49½′ N., long. 3° 53½′ E. *Variation*, 15° *W.*

8. — North Sea. — *Germany. — Elbe River. — Additional Semaphore at Cuxhaven.*—A semaphore has been established on the Alte Liebe dike, at the west side of entrance to the port of Cuxhaven, in order to signal to approaching vessels the occasional closing of the entrance; in this case the arm of the semaphore will be placed in a horizontal position, pointing towards the river. While this signal is shown, entering the port is prohibited, as is also going alongside the Alte Liebe dike. This regulation does not extend to passenger steamers, nor to special cases for which permission has been obtained.

9.—Baltic Entrance.—*Kattegat.—Denmark.—Aarhuus Bay. —Aarhuus.—Alteration in Colour of Light on Old North Pier.*— On 1st December, 1889, the following alteration would be made in

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the colour of the light on the old North pier head, at the entrance to the Inner harbour, Aarhuus. The light will show *red* in the fairway of the harbour entrance, and various colours through an arc of about 34° on either side of the *red* light as follows :—*Lilac, orange, yellow, white, green* and *blue*, and again, *lilac, orange, &c.* ; each colour being shown through an arc of nearly 3°. Over the inner harbour, the light shows *green* from the bearing of S. 14° W. to S. 75° W. Position, lat. 56° 9½′ N., long. 10° 13½′ E. *Variation*, 11° *W.*

10.—Baltic Entrance.—*Kattegat.—Sweden.—Leading Lights on Lilla Warholmen.*—The lights, which kept in line lead into Warholm sound, are now exhibited. The southern light is a *fixed red* light, elevated 72 feet above the sea. Position, lat. 57° 42′ 20″ N., long. 11° 42′ 40″ E. *Variation*, 12° *W.* The northern light is a *fixed white* light, elevated 95 feet above the sea. It bears N. 32° W. from the southern light, distant 148 yards.

11.—Baltic Entrance.—*Kattegat.—Denmark.—Frederikshavn. —Alterations in Harbour Lights.*—On 16th November, 1889, a provisional light would be exhibited from a mast on the Western pier-head of the Outer harbour, Frederikshavn ; it is a *fixed red* light, elevated 30 feet above the sea ; illuminating apparatus, catoptric, or by reflectors. Also, on the same date, the two fixed *red* lights, which kept in line, bearing N. ¼ W., led into the harbour eastward of the West pier-head of the Outer harbour ; and the provisional *fixed red* light on the old South pier-head, would be discontinued. *Variation*, 12° *W.*

12.—Baltic.—*Gulf of Finland.—Northern Shore.—Hangö.— Hangöstad Harbour.—Leading Lights Discontinued.*—The fixed *green* light on the mole head of Hangöstad harbour, and the fixed *white* light on the mound northward of the harbour, have been discontinued—the works in connection with the extension of the mole having made such progress, that the lights are no longer available as leading lights.

13.—Baltic.—*Gulf of Finland.—Northern Shore.—Hangö Road.—South Eastern Approach.*—(1.) *Particulars of Shoal near Fairway.*—With reference to notice in 1889, on the existence of a shoal, with 15 feet water on it, lying near the fairway in the

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approach to Hangö road from the south-eastward, the shoal (*Grönbada grund*) extends 54 yards in a north and south direction, with a breadth of 40 yards, and lies with the West extreme of Utra Sten Skar bearing N. 6° E., distant 1¾ mile. A stake beacon, red above and white below, and surmounted by a red flag with white square in centre, has been placed in 29 feet water to mark this shoal. Position, lat. 59° 45′ 15″ N., long. 23° 7′ 15″ E.

(2.) *Particulars of Shoal Southward of Grönbåda Grund.*—Also the shoal (*Grönbåda Sodra grund*) with a depth of 3¾ fathoms lying S. by E. ½ E., 10½ cables from Grönbåda grund, extends 175 yards in a N.N.E. ½ E. and S.S.W. ½ W. direction, with a breadth of 58 yards. A red stake beacon, surmounted by a red flag, has been placed in 32 feet water to mark this shoal. Position, lat. 59° 44′ 20″ N., long. 23° 8′ 5″ E. *Variation*, 5° *W.*

14.—Baltic.—*Gulf of Bothnia.—Russia.—Temporary Withdrawal of Storkallegrund Light-vessel.*—The Russian Government has given notice that on 9th November, 1889, Storkallegrund light-vessel was withdrawn from her station about 5¾ cables westward of Judasstenarne, for repairs. Position, lat. 62° 40′ N., long. 20° 43′ E.

15.—Norway.—*West Coast.—Biörö Cluster.—Light on Rækōen.*—On 1st December, 1889, a light would be exhibited on Rækōen, Biörö Cluster. It will be a *fixed* light, showing *white* from the bearing of S. 57° E. to S. 3° E.; *red* from S. 3° E., through south, to S. 53° W. (over Lökefald and Hundene); and again *white* from S. 53° W. to S. 70° W. (leading clear of Stokgrund). It is elevated 64 feet above the sea, and visible from a distance of 6 miles. Position, lat. 64° 36′ 30″ N., long. 10° 52′ 20″ E. *Variation*, 13° *W.* This light will not be constantly attended to; it will be exhibited annually from 1st August to 15th May.

16.—Spain.—*West Coast.—Fog-Signal on Cape Finisterre.*—On 1st December, 1889, a fog-signal would be established near the southern extreme of cape Finisterre, at an elevation of 362 feet above H.W. The signal will be a siren, worked by compressed air, which, during thick or foggy weather, will give *every forty seconds*—two blasts, each of *three seconds*' duration, separated by an interval of silence of *two seconds*, and followed by an interval

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of silence of *thirty-two seconds*. The fog-signal station, rectangular in shape, and white in colour, is situated 164 yards from the coast in a southerly direction, and 27 yards southward of the lighthouse.

17.—PORTUGAL.—*West Coast.—Harbour Light at Milfontes.*—On 1st November, 1889, a harbour light was exhibited at the Villa Nova, Milfontes, north side of entrance to the river Mira. It is a *fixed white* light of the fifth order, shown from two iron supports on the centre of the keepers' dwelling. Approximate position, lat. 37° 43′ N., long. 8° 47′ W.

18.—MEDITERRANEAN.—*Balearic Islands, and Coast of Spain.*—Information concerning the undermentioned lights and lighthouse, in the Balearic islands, and on the coast of Spain :—

(1.) CONEGERA ISLET LIGHT, *revolving* white, attains its greatest brilliancy *every thirty-five to forty seconds*, not every minute as heretofore stated. Position, lat. 39° 0′ N., long. 1° 13′ E.

(2.) DRAGONERA ISLET LIGHT, *fixed and flashing* white, is varied by flashes *every sixty-five seconds*, not every two minutes as heretofore stated. Position, lat. 39° 35′ N., long. 2° 19′ E.

(3.) CAPE SAN SEBASTIAN LIGHTHOUSE, constructed of stone, is painted red, not white as heretofore stated. Position, lat. 41° 53′ N., long. 3° 12′ E.

19.—MEDITERRANEAN.—*Capraia Island.—Semaphore on Mount Arpagna.*—On 1st November, 1889, a semaphore was established on mount Arpagna, S.W. part of Capraia island. Position, lat. 43° 1¼′ N., long. 9° 48′ E.

20.—MEDITERRANEAN.—*Intended Light on Linosa.*—A lighthouse is in course of construction on the N.E. point of Linosa island; and it is probable the light will be exhibited therefrom about the month of April, 1890. Approximate position, lat. 35° 52½′ N., long. 12° 53½′ E.

21.—MEDITERRANEAN. — *Ionian Sea. — Greece. — Cephalonia Island.—Guardiana Island Light.—Temporary Discontinuance.*—On 13th November, 1889, Guardiana island light, south coast of Cephalonia island, would be discontinued, pending the establishment of a new illuminating apparatus. Position, lat. 38° 8¼′ N., long. 20° 26½′ E.

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22.—MEDITERRANEAN.—*Greece.—Cerigo Island.—Kapsali Bay Light.—Temporary Discontinuance.*—Kapsali bay light, south coast of Cerigo island, has been discontinued, pending the establishment of a new illuminating apparatus. Position, lat. 36° 8¼′ N., long. 23° 0½′ E.

23. — MEDITERRANEAN. — *Egypt. — Suez Canal. — Port Saïd Western Breakwater.—Re-Exhibition of Permanent Light, and Discontinuance of Provisional Light.*—The lighthouse near the extremity of the Western breakwater at that port has been rebuilt; and on 15th November, 1889, the permanent light would be re-exhibited; it is a *fixed red* light (lighted by gas, Pinstch system), visible from a distance of 8 miles. The lighthouse, erected on piles 82 yards seaward of the submerged extremity of the Western breakwater, is constructed of iron framework, in the shape of a cone. Also, on the same date, the fixed *red* light, provisionally moored about 110 yards seaward of the submerged extremity of the Western breakwater, would be discontinued.

24.—BLACK SEA.—*Krimea.—West Coast.—Cape Tarken.—Fog-Signal Re-Established.*—The steam siren, giving a blast of *two seconds'* duration *every half minute*, has been re-established.

25.—AFRICA.—*West Coast.—Light at Nova Redonda.*—On 28th September, 1889, a light would be exhibited on the northern angle of the fort at Nova Redonda. It is a *fixed white* light, elevated 103 feet above the sea, and visible from a distance of about 15 miles. Position, lat. 11° 7′ S., long. 13° 53½′ E.

26.—INDIAN OCEAN.—*Seychelles.—Mahé Island.—Port Victoria. Buoyage, Occasional Lights, and Beacons.*—Particulars concerning the buoyage, occasional lights, and beacons, at port Victoria and approach, Seychelles:—(1.) The outer buoy is a *bell* buoy, chequered white and red, moored with port Victoria lighthouse bearing S.W. ¾ W., distant $1\frac{3}{10}$th mile, and Connan point W. ¾ S. A *red* light is shown from this buoy when the mail steamer is expected. The buoy, marked "Mail steamer" on plan, No. 722, has been removed. (2.) A mooring buoy, painted red, is moored with the lighthouse bearing W. by S. ¼ S., distant 5¾ cables, and Connan point W. by N. ¼ N. A *white* light is shown from this buoy when the mail steamer is expected. (3.) A buoy, of small

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size, chequered red and white, is moored with the lighthouse bearing S.W. by W. ¼ W., distant 5½ cables, and Connan point W. by N. A *red* light is shown from this buoy when the mail steamer is expected. (4.) A mooring buoy, painted red, is moored with the lighthouse bearing S.W. ¾ W., distant 8½ cables, and Connan point W. by N. ¾ N. A *white* light is shown from this buoy when the mail steamer is expected. (5.) A mooring buoy, painted red, is moored with the lighthouse bearing S.W. by S., distant 2 cables, and Connan point N.W. by W. ¾ W. A *white* light is shown from this buoy when the mail steamer is expected. The western side of the channel entering the Inner harbour is marked as follows :—The two posts on the reef opposite the lighthouse have been replaced by stone beacons, chequered white and red ; the post on the reef 2¾ cables from the lighthouse remains ; the post, 3¾ cables from the lighthouse, has been replaced by a stone beacon, chequered white and red ; posts, and a stone beacon, chequered white and red (on the south extreme) mark the point southward of the end of Victoria pier. The eastern side of the channel entering the Inner harbour is marked as follows :—The three posts have been replaced by stone beacons, painted black. *Variation*, 5° *W.*

27.—Arabian Sea. — *Nine Degrees Channel. — Unsuccessful Search for Reef Reported N.E. of Minikoi Island.*—In consequence of a reef having been stated to exist in the Nine Degrees channel, about 50 miles N.E. of Minikoi island, in lat. 8° 48′ N., long. 73° 40′ E., by the master of the s.s. *Noord Braband*, August, 1889, who reported it as being 3 miles in length, in a S.E. and N.W. direction, an examination of the locality has been made by Commander R. F. Hoskyn, R.N., in charge of the India Marine Survey, with the following result:—The examination, carried out in the I.G.S.S. *Investigator*, and extending over three days, from 2nd to 4th November, 1889, embraced the reported position of the reef between lat. 8° 35′ and 9° 5′ N., and long. 73° 15′ to 74 °0′ E. The least depth found on the suspected spot was 1,179 fathoms, gray ooze, and no indication was afforded by the soundings of the existence of shallow water. On one occasion, however, some patches of what appeared to be discoloured water were observed ; but they were all examined and proved to be merely the reflection

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of clouds in smooth streaks of water. Throughout the time the weather was uniformly fine, and favourable for observations, and the positions of the sounding were satisfactorily determined. Considering the detailed nature of this examination by Commander Hoskyn, and the fact of the locality being near the track of shipping using the Nine Degrees channel, the existence of this extensive danger is considered disproved.

28.—India.—*West Coast.—Gulf of Cutch.—Mandvi Light Temporarily Discontinued, Provisional Light Exhibited.*—On 20th October, 1889, Mandvi light (fixed white, visible 18 miles), would be discontinued, pending the fitting of a new illuminating apparatus; and on the same date, a provisional light would be exhibited from the breakwater head. The provisional light is a *fixed white* light, elevated 37 feet above H.W., and visible from a distance of about 9 miles. Position, lat. 22° 49½′ N., long. 69° 20½′ E. Further notice will be given as to the date of exhibition of the permanent light.

29.—Eastern Archipelago.—*Java Sea.—Bavean Island.*—(1.) *Non-Existence of Milton Rock.*—With reference to notice in 1875, on the existence of Milton Rock, with a depth of 16 feet, on which the s.s. *Milton* was reported to have struck at 3h. 45m. a.m. on 31st August, 1875, and stated to lie about 4 miles westward of Bavean island, or in (approximately) lat. 5° 48′ S., long. 112° 30′ E.; a close examination of the locality westward of Bavean island has been made in H.N.M. surveying-vessel *Hydrograaf*, and no indication of Milton rock was found, the depths around its reported position being 32 to 37 fathoms; hence Milton rock has been removed from the Charts.

Note.—A sunken rock (*Djambang rock*) with 7 fathoms water on it, was during the examination found lying with cape Alang, south extreme of Bavean island, bearing S.E. by E. ½ E., distant about 6 miles. Position, lat. 5° 50′ S., long. 112° 32′ E.

(2.) *Non-Existence of Hastings Rock.*—Also, an unsuccessful search has been made in H.N.M. surveying-vessel *Hydrograaf* for Hastings rock, reported by the British ship *Marquis of Hastings* in 1826, as lying with Bavean island bearing N.N.E. ½ E., distant about 17 miles, or in (approximately) lat. 6° 6′ S., long. 112° 28′ E.;

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hence Hastings rock has been removed from the charts. *Variation*, 2° *E.*

30.—Eastern Archipelago.—*Java Sea.*—(1.) *Particulars of Le Bœuf (Annie Florence) Reef.* — With reference to notice in 1881, on the confirmed existence of Le Bœuf (also called Annie Florence) rock, originally reported in 1879 by F. Le Bœuf, Master of the British barque *Annie Florence*, as lying in (approximately) lat. 5° 16′ S., long. 118° 21′ E., or about 45 miles north-eastward of Bavean island. On the authority of the Commander of H.N.M. surveying-vessel *Hydrograaf*, Le Bœuf reef, on which the sea generally breaks heavily, is about 44 yards in extent, and has an estimated depth of 1 fathom on it. At about half a cable's length from the reef, the depth is 18 fathoms, stones, and at the distance of 3½ cables, soundings of 26 and 28 fathoms, over sand, were obtained. Position, lat. 5° 12′ 50″ S., long. 118° 17′ 20″ E. In clear weather, mount Tingi, Bavean island, may be seen when near the reef, bearing S. 46° W.

(2.) *Unsuccessful Search for Arrogant Shoal.*—Also, from a search made for Arrogant shoal it is considered not to exist in the position reported (lat. 5° 13′ S., long. 112° 56′ E.), but it is still doubtful whether this shoal may be considered identical with Le Bœuf reef. P.D. has therefore been placed against Arrogant shoal.

(3.) *Non-Existence of Oosterling Reef.*—Also, a search had been made for Oosterling reef, in lat. 5° 28′ S., long. 112° 24′ E., but no sign of any danger was found. Consequent on this search, and from the vague nature of the original report, Oosterling reef has been removed from the charts. *Variation*, 2° *E.*

31.—Japan.—*Kiusiu.—N.W. Coast.—Sunken Rocks in Iki Channel, and on South Coast of Iki Sima.*—By notice, dated 23rd August, 1889, the existence of the undermentioned sunken rocks are reported lying in Iki channel, and on the south coast of Iki sima :—

(1.) A rock, with a depth of 1¼ fathom, lies near the fairway in Iki channel, with Yebosi sima lighthouse bearing S. 75° E., and the eastern extreme of Na sima North. Position, lat. 33° 42′ 35″ N., long. 129° 52′ 20″ E.

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(2.) A rock, with a depth of 2¼ fathoms, lies in Iki channel, with the north extreme of Na sima, in line with the Watch-house on Iki sima, bearing N. 87° W., and Akasi saki, the N.E. extreme of Iki sima, N. 44° W. Position, lat. 33° 44″ 40′ N., long. 129° 54′ 10″ E.

(3.) A rock, with a depth of 1¼ fathom, lies off the south coast of Iki sima, with Ko saki bearing S. 73° W., distant 4¼ cables. Position, lat. 33° 42′ 25″ N., long. 129° 43′ 30″ E.

(4.) A rock (*Tsurizone rock*), with a depth of 1¾ fathom, lies 4¼ cables southward of Hira sima, with Ko saki bearing N. 86° E., and western extreme of Naga sima N. 7° W. Position lat. 33° 41′ 35″ N., long. 129° 37′ 50″ E.

(5.) A rock (*Sorazone rock*), with a depth of 3¼ fathoms, and 5 cables in extent in a north and south direction, lies nearly in the fairway of the southern entrance to Go no Ura, 6 cables distant from Tskuye sima, and with the N.W. extreme of that islet in line with the north extreme of Hira sima. Position, lat. 33° 43′ 5″ N., long. 129° 39′ 40″ E.

(6.) A rock (*Ozone rock*), awash at L.W. spring tides, is an extension of the shoal shown on Admiralty Chart, No. 127, on the eastern side of entrance to Go no Ura; it lies 3½ cables from the coast of Iki sima, with the south extreme of Haru sima bearing S. 86° W., and N.E. extreme of Oö Sima N. 45° W.

(7.) The rock (*Hirase rock*), in the northern part of Go no Ura, and shown on Admiralty Charts as "Covers," lies a little westward of the position given, with Tskuye sima bearing S. 27° W., distant $1\frac{8}{10}$ mile.

Caution.—There are many rocks and shoals near the coasts in this locality, as yet not charted. Careful navigation is therefore needed. The depths given are at L.W. spring tides. *Variation, 4° W.*

32.—JAPAN.—*Simonoseki Strait.—Western Entrance.—Light on Narusi Rock.*—On 21st September, 1889, a light would be exhibited from the beacon (which has been rebuilt during the present year) on Narusi rock, north side of western entrance to Simonoseki Strait. It is a *fixed white* light, visible from the bearing of S. 86° E., through north, to S. 43° W.; elevated 17 feet above H.W.,

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and should be seen from a distance of 3 miles. The beacon, constructed of stone and circular in shape, is painted white. Position, lat. 33° 54′ 45″ N., long. 130° 54′ 50″ E. *Variation*, 4° *W.*

Note.—The light is kept burning day and night by automatic arrangement, without the constant attendance of a keeper. Should the light be extinguished by accident, there may be some delay in relighting it.

33.—Sea of Japan.—*Non-Existence of Waywoda Rock.*—This rock was originally reported by the Russian corvette *Voevoda*, when proceeding from Hakodate to Peter the Great bay. It was seen at a distance of 3 miles from the ship at 7h. p.m. on 28th June, 1859, during thick weather, and estimated to be about 12 feet above water; the position assigned by dead reckoning, being lat. 42° 16′ N., long. 137° 18′ E. The rock was searched for on two occasions by French vessels of war without success prior to 1886. In September, 1886, eight of Her Majesty's ships passed near the assigned position of the rock, in such a manner that an area of 40 miles in latitude, and 62 miles in longitude, was examined, and no sign of the rock was observed. In June, 1888, an American whaling barque reported having seen two rocks from 8 to 12 feet high, about 500 yards apart, in lat. 42° 30′ N., long. 137° 5′ E., or about 15 miles north-westward of the *Voevoda's* reported position. Consequent on this latter report, a further special search has been made by five of Her Majesty's ships on the China station, throughout 7th September, 1889. During this search, the position of the rocks reported by the American whaling barque, as well as that of the Waywoda rock, was passed over without seeing any signs of a rock above water, or obtaining any soundings indicative of shallow ground. After a careful review of the above circumstances, it is considered that the objects seen by both the *Voevoda* and the American whaling barque were floating, and therefore the rock has been removed from the Admiralty Charts.

34.—Australia.—*East Coast.—Pioneer River Approach.—Sunken Rock North-Eastward of Round Top Island.*—The Commander of the B.I.S.S. *Toroba* has reported the existence of a sunken rock lying about 6 cables north-eastward of Round Top

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island, Pioneer river approach; this rock (*Toroba rock*), with about 19 feet over it at L.W., lies with the following bearings:—Round Top island summit, S.W. ½ S.; Flat Top island lighthouse West. Position, lat. 21° 9′ 45″ S., long., 149° 17′ 50″ E. *Variation*, 7° *E.*

35.—Australia.—*South Coast.—Port Phillip Entrance.—Submarine Telegraph Cable between Swan Island and Observatory Point.*—A submarine telegraph cable has been laid between Swan island and Observatory point, within the entrance to port Phillip. The cable is laid from Swan beacon to Pope's Eye fort (situated near the white pile beacon on the S.W. part of that shoal), and thence to Observatory point.

Caution.—Mariners are warned that anchorage within 4 cables on either side of this cable is prohibited.

36.—Tasmania.—*Bass and Banks Straits.—Intended Alteration in Colour of Lighthouses.*—On 1st January, 1890, or as soon after as may be, the lighthouses on the coasts of Tasmania, together with those on King island, and Kent group (Bass strait), and on Goose, and Swan islands (Banks strait), will be painted entirely white. At present, the lower part of the lighthouses are painted white, and the upper parts red.

37.—North Pacific.—*Palmyra Island.—Extension of Reef on Eastern Side.*—Commander J. E. T. Nicolls, H.M.S. *Cormorant*, reports that shoal water extends about 2 miles eastward of the edge of the coral reef off the eastern edge of Palmyra island, to a distance of about 3 miles from the island. The northern edge of the reef appeared to trend in an E. ⅛ S. direction from Portsmouth point, and the southern edge in an E. ½ N. direction from Bird islet. With Portsmouth point bearing W. ½ N., distant $1\frac{6}{10}$ths mile, the *Cormorant* found depths of less than 3 fathoms. Position, lat. 5° 52′ N., long. 162° 5′ W. *Variation*, 7° *E.*

38.—North America.—*U.S. Pacific Coast.—California.—San Francisco Harbour.*—(1.) *Bell Buoy South-Westward of Mile Rocks.*—On or about 1st November, 1889, a *bell* buoy would be placed in 19 fathoms water, south-westward of Mile rocks, south side of entrance to San Francisco harbour. The buoy, painted red and black in horizontal stripes, is moored on the line joining Bonita

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point lighthouse and the northern Seal rock, with Mile rock bearing N.E. by E. ½ E., distant half-a-mile.

(2.) *Angel Island.—Position of Fog-Signal.*—The fog-signal (bell) on Angel island, San Francisco harbour, is erected on Knox point, the S.W. extreme of the island, not on Blunt point, the S.E. extreme, as heretofore stated. *Variation*, 17° *E.*

39.—South America.—*Chile.—Patagonian Channels.—English Narrows.—Beacons on Mid-Channel Island.*—Two beacons have been erected (one on the south point, the other on the north point) on mid-channel island, English narrows; the beacons consist of iron tripods, surmounted by a V, the seaward faces being plated with iron, the whole painted white. The southern beacon, 14 feet high, carries an iron disc, 1½ foot in diameter, on the upper part. Position, lat. 48° 58′ S., long. 74° 25′ W. The northern beacon (erected on the same spot as the old beacon) is 11 feet high. Also, with reference to notice in December, 1889, and previous notices on beacons and buoys in Patagonian channels, the following particulars have been published:—

(3.) *Clyone Reef Beacon*, 11 feet above H.W., constructed of stones and triangular in shape, is surmounted by a tripod and frame-work globe. This upper portion is painted white, the rest of the structure red. Position, lat. 51° 59¼′ S., long. 73° 40¾′ W.

(4.) *Michael Point Shoal Buoy*, cylindrical (horizontally) in shape, is painted red and white in vertical stripes, with the name *Miguel* on it in white letters upon a black ground. Position, lat. 50° 17½′ S., long. 74° 52¼′ W.

(5.) *Fawn Rock Buoy*, cylindrical (vertically) in shape and painted red, is surmounted by a tripod and frame-work globe, painted white. It is moored in 12 fathoms water, with north point of Pesca creek bearing N. 9° E., and south extreme of Romulo island N. 45° W. Position, lat. 50° 17′ S., long. 74° 53′ W.

(6.) *Abtao Shoal Buoy*, cylindrical (horizontally) in shape, is painted red and white in vertical stripes, with the name *Abtao* on it in white letters upon a black ground. It is moored in 14¾ fathoms water, with False point bearing N. 89° W., and Perch islet N. 18° W., distant 2 cables. Position, lat. 49° 15′ S., long. 74° 22′ W.

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(7.) *Gorgon Reef Beacon*, 10 feet above H.W., constructed of stones and triangular in shape, is surmounted by a tripod and frame-work globe; the whole painted white. Position, lat. 49° 11′ S., long. 74° 22½′ W.

(8.) *Talisman Rock Buoy*, cylindrical in shape, is painted red and white in vertical stripes, with the name *Talisman* on it in white letters upon a black ground. Position, lat. 48° 55½′ S., long. 74° 19′ W.

Caution.—As all these buoys are in unfrequented localities, no confidence can be placed on their maintaining their positions. *Variation*, 21° E.

40.—South America.—*East Coast.—Rio de la Plata.—Position of Chico Bank Light-Vessel.*— Chico bank light-vessel is now moored northward of Chico bank, and is supposed to be nearly in mid-channel, so that she may be passed on either side. Approximate position, lat. 34° 46′ S., long. 57° 29¾′ W. As the position is necessarily vague from want of objects to fix her properly, vessels should not pass too far from this light-vessel, which is moreover, like others in the Rio de la Plata, liable to drag.

41.—West Indies.—*Puerto Rico.—South Coast.—Port Ponce. —Discontinuance of Harbour Light.*—By notice, dated 2nd October, 1889, the light (fixed *red*) on the Harbour Office at port Ponce is discontinued.

42.—United States.—*Mississippi.—Pascagoula River.—Change of Characteristic of Rear Range Light for Entering.*—On or about November 21st, 1889, the rear light of the range for entering Pascagoula river would be changed from a fixed white to a *fixed red* light.

43.—United States.—*Maryland.—Chesapeake Bay.—Light and Fog-Signal on Holland Island Bar.*—On or about 25th November, 1889, a light would be exhibited from a lighthouse recently erected in about 9 feet water on the shoal extending southward of Holland island, entrance to Holland and Kedge straits, eastern shore of Chesapeake bay. It is a *fixed white* light of the fourth order, elevated 43 feet above H.W., and visible from a distance of about 12 miles. The lighthouse consists of an iron screw pile foundation, painted brown, surmounted by a white hexagonal frame

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dwelling, with brown roof, and black lantern. Position, lat. 38° 4′ 10″ N., long. 76° 5′ 25″ W. Also, a fog-signal would be established at Holland island bar lighthouse. The signal is a bell, struck by machinery, which, during thick or foggy weather, will be sounded *once every ten seconds*.

44. — UNITED STATES. — *New York* — (1.) *Princess Bay Light. — Intended Alteration in Character.* — On or about 1st January, 1890, the following alteration will be made in the character of Princess bay light, approach to New York from the southward. It will be a *fixed and flashing* white light of the fourth order, showing a flash *every five seconds*. Position, lat. 40° 30′ N., long. 74° 12½′ W.

(2.) *Fort Tompkins Light.—Intended Alteration in Character.*— Also, on the same date, the following alteration will be made in the character of fort Tompkins light, approach to New York from the southward. It will be a *flashing* light, showing *red* and *white* flashes alternately, with an interval of *ten seconds* between the flashes. Position, lat. 40° 36¼′ N., long. 74° 3½′ W.

45. — UNITED STATES.—*New York. — Execution Rocks Lighthouse.—Intended Sector of Red Light.*—On or about 1st January, 1890, a sector of *red* light will be shown from Execution rocks lighthouse, Long island sound, northern approach to New York. The sector will be visible through an arc of about 37°, or from the bearing of N.E. ¼ N. (leading just clear of the southern point of Hart island) to E. by N. (leading just southward of Middle reef). Position, lat. 40° 52¾′ N., long. 73° 44½′ W. *Variation*, 8° *W.*

46. — BAY OF FUNDY. — *South Shore. — Harbour Light at Annapolis.*—On 30th July, 1889, a harbour light was exhibited from a lighthouse erected at Annapolis, south shore of bay of Fundy. It is a *fixed red* light, elevated 30 feet above H.W., and visible from a distance of 7 miles. The lighthouse, 28 feet high, is a square wooden building, painted white. It is situated near the shore, on a piece of land locally known as the Engineer's Lot, a short distance north-eastward of the old Government pier. Position, approximate, lat. 44° 44′ 50″ N., long. 65° 31′ 5″ W.

47.—NEWFOUNDLAND.—*Strait of Belle Isle.—South Shore.— Cape Norman Lighthouse.—Delay in Establishment of Fog-Signal.*

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—With reference to notice that about 31st October, 1889, or as soon after as the machinery could be erected, it was intended to establish a fog-signal at cape Norman lighthouse, south shore of strait of Belle Isle; by further notice, dated 6th November, 1889, it has been found impossible to establish the signal this season, and probably it will not be established before July, 1890. The signal will be a steam horn, giving blasts of *five seconds'* duration, with intervals of *five seconds* between the blasts. Position, lat. 51° 38′ 5″ N., long. 55° 54′ 5″ W. Further notice will be given.

48.—Labrador.—*Strait of Belle Isle.—North Shore.—Greenly Island Fog-Signal.—Alteration in the Interval between the Blasts.* —The following alteration has been made in the interval between the blasts of the fog-horn on Greenly island, north shore of strait of Belle Isle:—The horn now gives blasts of *ten seconds'* duration, with intervals of *eighty seconds* between the blasts. Position, lat. 51° 22′ 35″ N., long. 57° 10′ 50″ W. This alteration has been made to further mark the difference between this fog-horn and the fog-whistle near Amour point lighthouse.

Official Return of British Wrecks in November, 1889.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of November, 1889, and the number of lives lost, are as follow:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	46	18,464	64
Steam	11	7,988	20
Total	57	26,452	84

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in November relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—Thomas Gray, Assistant-Secretary, Marine Department.—Board of Trade, 2nd December, 1889.

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OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,
2nd December, 1889.

THE following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

NOTE.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
664	Africa, E.: Sheet X.	Gaze bay to N. Head reefs and Pemba island S. November.
1389	Gulf of Siam: Koh Sichang Harbour	New Chart. November.
2894	China, E.: Lian River... ...	Extensive corrections of river entrance. November.
2349	East Coast of Australia: Queensland, Magnetic island to Double point	New Chart. November.
1185	River Thames: Sea Reach ...	Medway river, extensive corrections. December.
1170B	Holyhead to Liverpool: Eastern sheet...	Extensive Corrections. December.
838	Andaman Strait between Middle and South Islands	Entrances. November.
1669	Borneo: River Bruni: Plan added, Inner bars	New Chart. September.
2460	Kamchatka to Kodiak island ...	Extensive Corrections. December.

Agent for the sale of Admiralty Charts, MR. J. D. POTTER, 31, *Poultry, London, E.C.*

THE Board of Trade have received from Her Majesty's consul at Rotterdam the following translation of a Notice recently issued by the Minister of Marine at the Hague:—

"Ministry of Marine.—Notice to Mariners.—Practising with explosive torpedoes in the 'Haringoliet,' near Helvoetsluis, and

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removal of the buoys used for marking out the practising range.—The Minister of Marine herewith gives notice that during the months of December and January, trials with explosive torpodoes will be made in the roads of Helvoetsluis. During the time of such practising, torpedo boats with a red flag as danger signal from the masthead, will be stationed 800 metres above and below the dangerous area. The two black buoys which, according to the Notice in the Official Gazette of the 7th and 8th July last, were stationed below the port of Helvoetsluis, to mark the practising range, have been removed.—The Hague, 30th November, 1889."

The Board of Trade have awarded silver medals for gallantry and humanity to Jean Peruseige and Jean Chivrac, French Custom House officers at Bordeaux, who, at great risk to their lives, rescued a fireman belonging to the British s.s. *Vesta*, who fell into the Garonne, on the night of the 20th October, 1889.

The Board of Trade have awarded a silver shipwreck medal to Mr. S. C. Rasmussen, master of the Norwegian schooner *Consuelo*, of Christiansund, in recognition of his humanity in saving the shipwrecked crew of the pilot cutters *Lead On* and *Gladys* off Morte Point, Bristol Channel, on the 26th October, 1889.

The Board of Trade have awarded their silver medal for humanity in saving life at sea to William Dyer, master of the s.s. *Ben Voirlich*, of North Shields, in recognition of his services in rescuing the crew of the s.s. *Black Watch*, of Cardiff, which foundered at sea on the 11th November, 1888.

Her Majesty the Queen has been graciously pleased to confer the decoration of the Albert medal of the second class on John Barber, A.B., of H.M.S. *Lily*. The following is an account of the services in respect of which the decoration has been conferred. H.M.S. *Lily* was wrecked off Amour Point, Forteau Bay, coast of Labrador, on the 16th September, 1889, and seven of her crew were drowned. After her boats had capsized, and although it was known that two of the crew had been drowned near the same

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spot in attempting to effect communication with the shore, John Barber, A.B., volunteered to swim with a line through the surf, which he successfully accomplished, enabling a 4-inch hawser to be hauled ashore, whereby communication was established and the rest of the crew saved. The service was one of great risk and gallantry, the bottom being rocky and there being at the time a dense fog with an ebb tide and considerable swell.

The Board of Trade have awarded a binocular glass to Alfred Aimé Engrand, master of the French fishing boat *G* 333, of Gravelines, in acknowledgment of his humanity and kindness to the shipwrecked crew of the British s.s. *Batavia*, whom he rescued off the South Foreland, on the 31st October, 1889. The Board have also awarded sums of money to two of the crew of the fishing boat who manned the small boat which took off the shipwrecked men.

The Board of Trade have awarded a gold shipwreck medal and a sum of money to Leen Nieman, master, and silver shipwreck medals and sums of money to L. Spuy, Jan Van Drimmelen, and Jan Brandenburg, who accompanied Nieman in his fishing boat *Twee Gebroeders*, of 49 tons, and under circumstances of great risk and gallantry rescued the crew of the British s.s. *Yoxford*, of London, which stranded in very bad weather on the coast between the Brielle and the New Waterway, Holland, on the 28th November, 1889.

Official Inquiries at Home, 1889.

3928. *Starling*, Ketch, and *Stelling*, s.s.; former built at Burton Stather, 1859; owned by Mr. J. W. Craven; tonnage, 112; Hull to Gravesend; coal; latter built at Jarrow, 1876; owned by Mr. J. Fenwick and others; tonnage, 538; Chatham to Tyne; ballast; in collision off Sunk Lightship, October 18, 1889. Inquiry held at Hull, November 13, 1889, before Stratten and Broderick, Justices; Pickard, Bain and Bragg, N.A. Collision owing to the want of a proper look out on the *Stelling*. Certificate

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of master suspended for three months; recommended for one as mate.

3924. *Ceylon*, s.s.; built at Poplar, 1858; owned by Dr. M. D. Lavin; tonnage, 1,276; Stockholm to Christiania; 35 passengers; stranded on Kulla Ground, September 27, 1889. Inquiry held at Westminster, November 15, 1889, before Marsham, Judge; Ronaldson and Brooks, N.A. Stranding due to master mistaking his position off Smyge Point. He was also improperly absent from deck, and did not leave sufficient instructions with the officer of the watch. Certificate suspended for three months.

3925. *Chanticleer*, s.s.; built at Dumbarton, 1853; owned by Mr. R. Jobson and others; tonnage, 421; Blyth to Svorsberg; coal; not heard of since sailing, September 23, 1889. Inquiry held at Middlesbrough, November 13, 1889, before Dixon and Thompson, Justices; Knox and Castle, N.A. Vessel seaworthy. No evidence as to cause of loss.

3928. *Zephyr*, s.s.; built at Waterford, 1860; owned by Mr. J. T. Duncan and others; tonnage, 410; Cardiff to Flushing; coal; foundered in Bristol Channel, September 29, 1889. Inquiry held at Cardiff, November 18, 1889, before Lewis, Judge; Anderson and Davies, N.A. Loss owing to starboard bulwark, when struck by the sea, falling on one of the after ventilators, wrenching it from the deck, and thus admitting water into the hold. Master reprimanded for not making for the shelter of the Welsh coast. Owner, who did not use all reasonable means to ensure vessel's seaworthiness, ordered to pay costs.

3929. *Rosedale*, s.s.; built at Sunderland, 1877; owned by Mr. T. G. Beatley and others; tonnage, 609; Sundsvall to West Hartlepool; deals; stranded inside Ytter Grund, Oland, August 31, 1889. Inquiry held at Westminster, November 21, 1889, before Marsham, Judge; Ronaldson and Brooks, N.A. Casualty owing to mate not carrying out instructions of master as to altering course. Certificate not dealt with.

3931. *Cleveland*, s.s.; built at Newcastle, 1872; owned by Mr. R. S. Donkin and others; tonnage, 769; loading off Gandia, Spain; stranded on the beach, August 13, 1889. Inquiry held at Newcastle, November 22, 1889, before Milvain and Browne,

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Justices; French and Cosens, N.A. Casualty owing to anchor dragging, or cable parting, during a squall, without anyone on board being aware of it. Master reprimanded.

3936. *Amy Dora*, s.s.; built at Wellington Quay, 1875; owned by Messrs. Robinson and others; tonnage, 1,108; Savannah, U.S.A., to Genoa; cotton; stranded off Watchapreague Inlet, October 5, 1889. Inquiry held at North Shields, December 3, 1889, before Morrison and Robson, Justices; Methven and Ward, N.A. Stranding due to careless navigation. The master gave inadequate instructions when leaving deck, and second mate left bridge with no one on the look out. Certificates suspended for three and two months, respectively.

3937. *Zulette*, barque; built at Kennebecasis, New Brunswick, 1864; owned by Mr. J. Eskdale and others; tonnage, 763; Quebec to Sunderland; timber; abandoned waterlogged in lat. 57° 30′ N., long. 18° W., September 11, 1889, the master and two of the crew having previously been washed overboard when vessel was on her beam ends. Inquiry held at North Shields, December 2, 1889, before Morrison and Robson, Justices; Methven, Ward and Dyer, N.A. Casualty owing to stress of weather. Deck load not excessive.

3938. *Winsloe*, s.s., and *James*, dumb barge; former built at Seacombe, 1870; owned by London and Rotterdam Steamship Company, Limited; tonnage, 574; Rotterdam to London; general; in collision in Woolwich Reach, October 28, 1889, when one life was lost. Inquiry held at Westminster, December 6, 1889, before Marsham, Judge; Parish, Knox and Ronaldson, N.A. Casualty caused by failure of barge to exhibit a light.

3939. *State of Georgia*, s.s., and *Agate*, s.s.; former built at Govan, 1873; owned by State Steamship Company, Limited; tonnage, 1,507; Glasgow to New York; general cargo and 100 passengers; latter built at Rutherglen, 1878; owned by Mr. W. Robertson; tonnage, 59; to Glasgow with iron ore; in collision in Firth of Clyde, October 4, 1889, when one life was lost. Inquiry held at Glasgow, November 22, 1889, before Spens, Judge; Hore, Curme and Baker, N.A. Collision owing to master of *State of Georgia* failing to comply in time with Art. 16.

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He also committed a breach of Art. 18. Certificate suspended for three months.

FISHERY INQUIRY, 1889.

S. 33. *Providence* and *Ada*, dandies; former built at Dartmouth, 1876; tonnage, 72; latter built at Barking, 1868; tonnage, 67; both owned by Messrs. Hewett and Company; in collision on Swart Bank, October 19, 1889, when former sank. Inquiry held at Yarmouth, November 21, 1889, before Fellows and Worlledge, Justices; Wilson and Davies, N.A. Collision owing to *Providence*, which was running free, altering her course in order to clear some wreckage, and to *Ada* which was following on nearly a parallel course, and did not see the obstruction, not sufficiently altering hers.

OFFICIAL INQUIRIES ABROAD, 1889.

3926. *Calypso*, s.s.; lost one of her crew through the foundering of a barge she was towing from Aden to Perim, August 22, 1889. Inquiry held at Aden, September 5, 1889. Master took precautions for safety of lighter, and was not to blame.

3927. *Windhover*, barque; stranded on Bramble Cay, August 20, 1889. Inquiry held at Thursday Island. Casualty owing to a northerly current, not mentioned in sailing directions. A light necessary on Bramble Cay.

3930. *Provincia*, s.s.; and *Alliance*, Norwegian, s.s.; in collision in Straits of Gibraltar, when loss of life ensued, September 22, 1889. Inquiry held at Gibraltar, November 9, 1889. Collision partly due to careless navigation of *Provincia*, but Court not having examined witnesses for the *Alliance*, was not prepared to say whether there was any contributory negligence on her part. A charge of manslaughter preferred against mate of *Provincia*.

3932. *Centennial*, s.s.; and *Kanahooka*, s.s.; in collision off Bradley's Head, August 23, 1889, when former sank and one life was lost. Inquiry held at Sydney, September 2, 1889. Collision due to master of *Centennial* not keeping starboard side of fairway. Certificate suspended for twelve months.

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3933. *Bannockburn*, brigantine; beached in Byron Bay, July 16, 1889. Inquiry held at Sydney, September 23, 1889. Loss owing to stress of weather.

3934. *Inflexible*, s.s.; foundered off Port Hacking, August 27, 1889. Inquiry held at Sydney, September 16, 1889. Loss owing to vessel unaccountably springing a heavy leak.

3935. *Pioneer*, s.s.; combustion chamber of boiler collapsed off Tasman's Island, September 8, 1889. Inquiry held at Hobart, October 18, 1889. Casualty owing to a fireman, after blowing down the water in the boiler, leaving the cock open.

3940. *Astrion*, s.s., and *Joven Julian*, Spanish sailing-ship; in collision off Cape St. Vincent, November 21, 1889. Inquiry held at Malta, November 29, 1889. Collision caused by master of *Astrion* porting to a vessel on his starboard bow, whose side lights were obscured. Reprimanded.

NAUTICAL GOSSIP AT HOME AND ABROAD.

THE carrying of appliances for "oiling the waves" will be compulsory from the 31st March, 1890, as the rules issued by the Board of Trade under the Merchant Shipping (Life Saving Appliances) Act, 1888, provide in the list of equipment for vessel's lifeboats, "one gallon of vegetable or animal oil in a vessel of an approved pattern for distributing it in the water in rough weather."

THE present period of prosperity in shipbuilding and marine engineering has not been broken by any material difference between employers and workmen. It has been said that this is largely owing to the existence of an association among the shipbuilders of the Clyde, and recently that organisation has been extended so as to include the whole of the shipbuilding ports. After several previous meetings at Carlisle, on the 7th November, the National Association of Shipbuilders and Engineers was finally constituted and its code of rules adopted. Among other firms represented at

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the meetings may be mentioned Sir W. Armstrong & Co., Messrs. Hawthorn, Leslie & Co., and Messrs. Palmers, of the Tyne; Messrs. Barclay, Curle & Co., Mr. J. Inglis, Mr. W. Laird, Messrs. Napier's and Messrs. Thomson, of the Clyde; Messrs. Harland & Wolff, of Belfast, Messrs. Laird, of Birkenhead, and Messrs. Ramage and Fergusson of Leith. The object of the association is to adjust local disputes between employers and employed with due regard to the interests of both parties and to bring about better and more rational modes of settling disputes as to wages, &c., than the strikes which have in the past done so much mischief.

The British Consul at Bilbao in a recent report on the trade of that port states that during the last five years nearly 18 million tons of ore have been exported of which nearly 70 per cent. came to England and Scotland, the importing ports, in order being Middlesbro', Cardiff, Glasgow, Newport, Newcastle, Stockton, Sunderland, Swansea, and West Hartlepool. Some of the best mines in the immediate vicinity of Bilbao are becoming exhausted; but Biscay is an iron country, and new sites for mines are being selected every day.

Two of the companies which are engaged in the passenger trade to South Africa are about to introduce faster vessels than have yet run to the Cape. The Union Company have ordered a steamer from Messrs. W. Denny Brothers, of Dumbarton, which will be over 6,000 tons, and will steam 18 knots. Her dimensions are, length, 460 ft.; breadth, 54·5 ft.; depth, 37·5 ft. She will be propelled by twin-screws, driven by triple-expansion engines. This will be a great advance upon the present liners, which steam about 14½ knots; and they are considerably in advance of the South African passenger ships of a few years ago, as may be seen from the fact that while the voyage at present is frequently done from Cape Town to Southampton in a little over 17 days, the Government mail contract, only a few years ago, stipulated that it should not exceed 25 days.

Messrs. Donald Currie & Co. also have a new steamer in hand at the Fairfield Yard, on the Clyde, of 4,750 tons, and

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dimensions, length, 420 ft.; breadth, 50 ft.; moulded depth, 36 ft. She will be propelled by triple-expansion engines, which are to develop 5,000 I.H.P., and propel her at a speed of 15½ knots at sea. They have also two smaller vessels in hand by Barclay, Curle & Co. on the Clyde, the *Lismore Castle* and *Dounne Castle*, each 3,900 tons gross.

PROGRESS is being made with the Baltic and North Sea Canal undertaken by the German Government. It will be over 60 miles long, with a depth of 28 ft., and will have but two locks, one at each end. It will take an ironclad of the first class at all states of tide, and by it she will be able to steam from Kiel to the Elbe in less than eight hours. It will thus be seen that the advantage to Germany in the event of a war with a naval power is very great, rendering her fleet available for defensive purposes in both seas.

OPERATIONS in connection with the Nicaragua Canal were actually commenced on the 22nd October upon a section of the waterway twelve miles long, and also upon the pier, in order that the dredgers may commence working.

EFFORTS are being made to bring aluminium bronze into use for boiler fittings, and also for propellers. Experiments recently made have shown that it retains its tenacity through a large range of temperature. Its elastic limit is very high, it does not corrode, and it is said to be cheaper than some of the rival alloys which have been introduced during the last few years.

A CANAL is projected between the White Sea and Lake Onega, which latter is already connected with the principal navigable rivers of Russia. The new canal will be 146 miles long, and is to take vessels drawing 10 ft. Its total cost is estimated at 10,000,000 roubles.

THE *Blake*, which has been recently launched at Chatham, is not an ironclad, and yet she is 75 ft. longer than the belted cruisers which have been recently completed. She has a displacement of

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9,000 tons, much in excess of what has hitherto been associated with unarmoured ships. She has, however, an armoured steel deck under water 6 ins. thick. The *Blake* is 375 ft. in length, and 65 ft. beam, and will be propelled by twin screws with triple-expansion engines developing 20,000 horse-power, with forced draught. Her estimated speed on trial and with forced draught is 20 knots. She will cost £368,000. A sister ship, the *Blenheim*, is building at the Thames Ironworks, Millwall.

It is announced that a stone dry dock has been recently opened a Halifax, which will take merchant steamers of greatest draught and ironclads of the greatest beam. Its dimensions are:—Length, 580 ft.; breadth at top, 102 ft.; at bottom, 72 ft.; depth of water on sill, 30 ft. The dock is near the Admiralty dockyard, at the north end of the harbour, but is the property of a public company, and has cost £200,000. The company are to be subsidised to the extent of £2,000 a year for twenty years from the British Government, the Government of Canada, and the city of Halifax. The dock is the finest in America.

The *St. George*, a steam-yacht, building for Mr. E. T. Withes, at Leith, is it is said the largest yacht yet constructed in England. She will measure 830 tons gross, and will be of composite construction, the frame being steel and planking teak. The largest yachts hitherto built in England have been the *Amy*, 812 tons, and the *Eros*, 737 tons. This has been exceeded in America, where have been built the yachts *Alva*, 1,236 tons, *Bretagne*, 1,040 tons, and *Nourmahal*, 930 tons.

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THE

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TONNAGE, PAST AND PRESENT.

X.

THE definition due to Moorsom, with which we started this series, was—"*Tonnage* is the term by which we form an idea of the magnitude of vessels;" in this, the concluding paper, we purpose considering it as relating to yachts. Very early in the history of yacht racing, it was found necessary, if craft at all differing in size were to compete in the same race, that some allowance must be made to the smaller vessels, otherwise the larger craft, simply as a consequence of their size, would win. This arises from the fact that the resistance encountered by well-formed vessels at ordinary sailing speeds depends chiefly upon the area of the wetted surface of the bottom, which latter, speaking generally, varies as the square of any linear dimension, while the power of propulsion depends, to a large extent, upon the displacement, which varies as the cube of the linear dimension. In other words, comparing large vessels with small ones, within the limits where the same kind of rig is practicable, the sail-power increases with the size of the vessel in a much greater ratio than the resistance increases.

Displacement tonnage has been advocated as a good basis for time allowance in yacht racing from the consideration that sail-

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power increases roughly as the displacement. It was for some time in use in America, but was finally abandoned about ten years ago, it having been found to favour the production of vessels in which many of the bad qualities of what are known as "racing machines" were very fully developed. The object aimed at by the designer of the yacht was to get the largest sail-spread for a given displacement, and, consequently, the beam was increased, the lower lines made very fine and the keel deepened. The vessels built under these conditions were very stiff indeed at small angles of inclination, but their stability had very small range, and hence there were frequent cases of capsizing when the vessel was struck by a sudden squall when under full press of sail. In these vessels the tendency to what has been called the "skimming dish" form, for long a feature in American pleasure craft, acquired its extreme development. Displacement has never been used as a measure of yachts for time allowance in England, and for some years past its use has been abandoned in America.

Before going into a brief *resumé* of the history of the measurement of yachts in England, it may be stated generally that while each successive change of system has been rendered necessary by the production of some exaggerated type of craft, whose evil features were clearly induced by the rule of measurement, the new method hitherto has been found after a time in its turn to be the cause of evils nearly as great in some other direction. The last change of rule of measurement was made in December, 1886, and although the most eminent authorities are very sanguine as to its ultimate success, it is obvious that the time which has yet elapsed is too short for a definite judgment to be formed upon the question.

In England the earliest rule of tonnage for yachts was the rule of register tonnage in force when systematic yacht racing began, *i.e.*, builders' tonnage. We reproduce here the text of that rule in its final form:—"The length shall be taken on a straight line along the rabbet of the keel of the ship, from the back of the main stern-post to a perpendicular line from the fore-part of the main stem, under the bowsprit, from which, subtracting three-fifths of the breadth, the remainder shall be esteemed the just length of the

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keel to find the tonnage; and the breadth shall be taken from the outside of the outside plank in the broadest place in the ship, be it either above or below the main wales, exclusive of all manner of doubling planks that may be wrought upon the sides of the ship; then multiplying the length of the keel by the breadth so taken, and that product by half the breadth, and dividing the whole by 94, the quotient shall be deemed the true contents of the tonnage."

Rankine writing in 1862,* thus refers to the use of "builders' tonnage" as a measure of yachts:—"If the length for tonnage, builder's old measurement, were measured on the water-line instead of the keel, and the deduction of three-fifths of the breadth done away with, it would form a sort of rude approximation to the comparative power of different vessels to carry sail, and hence there may be some reason for the practice of using it in regulating the allowances to be made for differences of size in racing yachts."

As a matter of fact, a step had been taken in the modification of the rule a few years before this. The fact that the length for builders' tonnage was measured from the back of the post on the keel had led to very great rake in the stern-post in order to decrease the length for tonnage in proportion with the length on deck. To prevent this the Royal London Yacht Club in 1854 modified the rule by prescribing that the length should be taken on deck instead of along the keel. This provision by itself would have led to a general increase of tonnage in existing vessels and in vessels then building, and to prevent that it was decided to deduct the whole breadth from the length instead of three-fifths of the breadth. The formula which by builders' tonnage had been—

$$\text{Tonnage} = \frac{(\text{L.} - \frac{3}{5}\,\text{B.}) \times \text{B.} \times \frac{\text{B.}}{2}}{94}$$

thus became—

$$\text{Tonnage} = \frac{(\text{L.} - \text{B.}) \times \text{B.} \times \frac{\text{B.}}{2}}{94}$$

where L. is length on deck.

* "Shipbuilding, Theoretical and Practical," by W. J. M. Rankine, &c. London, 1862.

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The rule as thus amended is that known as the "Thames Rule," and on the formation of the Yacht Racing Association in 1875, it was adopted by them as the standard. The Association has since that period been the great authority on yachting affairs in Great Britain, and subsequent changes in the rules of the tonnage and rating of yachts have been made on their authority. This is a distinct advantage as they have either among themselves, or can easily obtain, the opinions of naval architects, yacht builders and practical yachtsmen. In 1879 the Yacht Racing Association further altered the rule by taking the length on the load-line.

It is, however, the Thames Rule of 1854 which is the rule recognised in the classification of yachts by Lloyd's; and which determines the "Thames Measurement" given in the tonnage column in the "Yacht Register." We quote this rule as it is given in Lloyd's Rules and Regulations for Yachts:—

"The dimensions are to be determined as follows:—

"*Length.*—The length is to be the distance from the fore-part of the main stem to the after-part of the stern-post, on the range of the upper-deck.

"*Breadth.*—The breadth is to be the greatest external breadth of the vessel.

"*Tonnage.*—The tonnage is to be computed in the following manner:—From the length deduct the breadth, multiply the result by the breadth, and that product by the half breadth, and divide by ninety-four. Provided any part of the stem or stern-post or other part of the vessel, at, or below, the load water-line, project beyond the length taken as above, such projection or projections shall for the purpose of finding the length be added to the length as above described."

Upon the Thames measurement thus defined are based the tables of scantlings prescribed for the construction of wooden yachts. Up to the present year the equipment for all yachts was based upon the same tonnage, while the scantlings of iron and steel yachts were based upon numerals similar to those used in Lloyd's rules for the construction of iron and steel ships. By an alteration in the rules for the present year, the equipment of

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yachts is settled in the same way as the equipment of ships, *i.e.*, a table is drawn up having regard to the *numeral* for iron and steel ships and the gross register tonnage for wooden yachts.

Thames measurement will probably long remain the recognised system of tonnage used to describe yachts. It, however, ceased to be the recognised standard for time allowance in 1881. A change was necessitated by developments in yacht construction which, combined with the inducements held out by the rule of measurement, led to the production of a very extreme type of yacht. The rule depending upon length and the square of the breadth was a fair measure of the sailing capabilities of the yacht until the introduction of the heavy lead keel. This feature increased the importance of depth, or rather of draught. The deeper the heavy lead keel was placed, the greater the power of the vessel to stand up under sail. It thus came about that vessels were constructed which were at the time described as a "plank on edge," and in which, owing to the small beam, the cabin accommodation was very restricted. These vessels had a large range of stability, and were practically uncapsizable; but, for all that, were mere racing machines, and were not such craft as anyone would build or buy for any purpose other than that of winning prizes. An attempt was made to tax depth by a rule of tonnage measurement adopted by the Corinthian and the New Thames Yacht Clubs in 1874. It was as follows:—

$$\text{Tonnage} = \frac{\text{Length} \times \text{Breadth} \times \text{Total Depth}}{250}$$

The length and breadth were the same as in Thames measurement, the depth was taken to the top of the covering board. This rule had one great defect, it induced low freeboard, and it was abandoned after a few years' trial. If in the place of *total depth*, *mean draught* had been used, with an appropriate divisor, the rule would probably have lasted much longer.

In 1881 the Yacht Racing Association, with a view to discouraging the narrow type of yacht, then at its most extreme development, adopted a new rule:—

$$\text{Tonnage} = \frac{(\text{Length} + \text{Breadth})^2 \times \text{Breadth}}{1730}$$

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The breadth was the extreme outside breadth of the vessel, and the length was measured from out to out on the load-line, it being provided that if any part of the stem or stern-post, or other part of the vessel, projected beyond the length so taken, such projections should be added to the length for the purposes of the rule.

The tonnage rule of 1881 was soon proved a failure. Under it excessively long vessels were still produced, and it was very soon seen that a further change was necessary. In 1880 Mr. Dixon Kemp, the able yachting editor of the *Field*, and the writer of valuable books and papers on yacht sailing and construction, proposed a method of calculating time allowance for yachts by a rule depending upon the area of sail and the length. The length of the vessel was to be measured on the load-water line, and the sail tonnage, as it was called, was to be obtained thus :—

$$\text{Tonnage} = \frac{\text{Length} \times \text{Sail Area}}{7000}$$

The sail area was not the actual area of the canvas, but was computed by measuring the spars. Thus in a cutter the quantity of sail that could be set as head sail was ascertained by the area of a triangle whose base was the length from the mast to the end of the bowsprit, and height from boom to shoulder of topmast. Similarly the sail aft was the area of a figure bounded by the boom, and the mast, and including the gaff. This rule was adopted by an American yacht club in 1882, and a modification of it was admitted soon after by the Yacht Racing Association in an appendix as an alternative to their tonnage rule. In 1886 a strong committee was appointed to consider the whole question of yacht tonnage for time allowance, it being felt that an efficient remedy must be provided for the existing state of things, and that the new rule, whatever it was, should be adopted for a period sufficiently long to induce yacht owners to build new racing craft free from the apprehension that their chances of success might be affected by further changes in the rule for measurement. A rule depending upon sail area alone had been proposed, but it was shown that that would have only perpetuated the evil due to the rule of 1881, as it would tend to increased length at the expense of the other dimen-

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sions. Finally, the Committee reported, and in December, 1886, the Yacht Racing Association adopted the resolution—

"That in future yachts in competitive sailing be rated only by the formula—

$$\frac{\text{Length on load-line} \times \text{sail area}}{6000}$$"

The divisor was chosen with a view to giving a result in "sail tons," not very different on the average from the tonnage by the late rule. The number 7,000 had been proposed at first, but this was found to give too small results, and as it was desirable to have a divisor convenient in practice, 6,000 was that ultimately adopted.

It was settled that the new rule should exist for seven years, and should only be repealed by a vote of three-fourths of the council of the Association, and the majority of a general meeting. Detailed rules were laid down for measuring and computing the sail area from the sail plan of the yacht, and at the annual meeting of the Association in February, 1888, the method of measurement was defined with still greater precision. The area of sail is, as we have said, not the actual area of canvas, but of a triangle on the fore-side of the mast, and a trapezium abaft it, extending to strictly defined points on the bowsprit, the topmast, the gaff, and the boom. Further, if the yacht has a square sail or sails their actual area is found, and if it exceeds the area of the *fore triangle* of sail, the excess is added to the sail area by rule. Also, if the yacht carries a spinnaker, and if the length of the spinnaker boom is greater than the base of the *fore triangle*, such excess is to be added to the base of the *fore* triangle in computing the sail areas.

In America there is no similar body to the Yacht Racing Association in England, but the two most important yacht clubs have rules of rating yachts for time allowance based on sail area and length, although the formulæ differ considerably from the English rule. The Seawanhaka Corinthian Yacht Club was the first club in the world to adopt a sail area rule in 1881. Its present rule, however, dating from 1883, differs in detail from that first adopted. The formula is :—

Add the square root of the sail area to the length on the load water-line, and half this sum will be the rating number.

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The rule of the New York Club is somewhat different. Twice the square root of the sail area is added to the length on the load water-line, and one-third of the sum gives the rating number. The sail area is regarded as a triangle, the base extends from the jib-stay on the bowsprit, or flying jibstay on the jibboom, to the end of the main boom, with a quarter the length of main gaff added; the perpendicular is measured from the gaff topsail block on the mainmast to the upper side of the main boom. The length of the vessel is measured from the forward side of stem at the water-line to the end of the water-line at the stern, the crew being stationed amidships.

It is hardly necessary to remark in conclusion that the register tonnage of yachts is measured under the same rule as that for other vessels. Gross register tonnage, or what in yachts amounts to the same thing, under-deck register tonnage, has often been proposed as a measure of yachts for racing. When it is remembered that register tonnage is a measure of volume, and that the interior volume of the ship, many reasons will be seen for concluding that it is about the worst possible basis for time allowance. It would lead to extreme fineness of lower lines, to small freeboard and also to useless thickening of the structure, and would thus be open to almost all the objections urged against other rules, in addition to the one last-mentioned, which is peculiarly its own.

QUADRUPLE-EXPANSION MARINE ENGINES.

ALTHOUGH the adoption of the triple-expansion engine in steamships, in place of the ordinary "compound" is comparatively recent, there has been for some time a further departure in the same direction, viz., the utilisation, in some instances, of even higher pressure steam than 150 or 160 lbs. per square inch, and the attaining of greater economy with these pressures ordinarily used in triple-expansion engines. Whether it be advisable, taking all the circumstances into consideration, to increase the working

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parts, in order to obtain some slight benefit in the greater range of steam expansion, may be said to be a moot point; but with pressures of 200 or 225 lbs. per square inch there appears to be an undoubted advantage. In any case, it will be of interest to trace the development of the quadruple-expansion engine, to note the various forms of design that have been adopted, and give a more or less complete indication of the extent of this new departure.

Without entering into an examination of all the various designs of quadruple-expansion engines that have been patented, and confining our attention mainly to those engines of this new type which have been constructed, it would appear that Messrs. J. F. & M. Rankine, of the firm of Rankine & Blackmore, Greenock, have a fair claim to be the inventors of the two-crank quadruple-expansion engine, having patented their design in April, 1882. About two years later the matter was taken up by Mr. W. Brock, of Messrs. Denny & Co., Dumbarton, and by Mr. G. Rodgers, at that time manager of the engineering department of the Barrow Shipbuilding Co., Barrow-in-Furness, which company constructed, in the year 1884, one of—if not the first—set of engines of this type, for the s.s. *County of York*. These engines were of much the same design as the tandem engines in the *City of Rome* and other large steamships, notably the White Star Liners, *Germanic*, *Britannic*, &c., the upper cylinders being supported by columns of wrought iron on top of the lower ones. The working pressure of steam was 164 lbs. per square inch, the cylinders being high pressure, 20 inches in diameter; intermediate high, 28½ inches; intermediate low, 40 inches; and low pressure, 57 inches diameter, indicating 984 horse-power. The consumption of fuel has not been recorded, but the engines appear to have given every satisfaction.

Allusion has already been made to the firm of Messrs. Denny & Co., Dumbarton, who have constructed the largest number of quadruple-expansion engines up to date, and who also adopt the "tandem" form, but modified according to Brock's patent, and thus a brief description of the leading distinctive features will be of interest. This form of design has been adopted

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to obviate the drawbacks incidental to the "tandem" arrangement of cylinders, whereby double stuffing-boxes are required between the cylinders for the piston rods, and access to the lower cylinders for examination or repair cannot be obtained without removing the upper ones, a matter of considerable difficulty, involving the disconnecting of valve gear, steam pipes, and other connections. In Brock's patent quadruple-expansion engine the upper cylinders have no valves or pipe connections fixed to them. The distributing valves for all the cylinders are in casings attached to the lower ones. The number of stuffing boxes is the same as for an ordinary compound engine, the usual upper tail-rod stuffing boxes of such engines being in this instance represented by the metallic packing for the piston rods between the two cylinders. Owing to the upper cylinders being unencumbered by valve boxes and pipe connections, they can be lifted from their place with almost as much facility as ordinary covers. This is, however, seldom necessary, as doors are fitted in the top or cover of the lower cylinders, by which access is obtained to their interior, except when the cylinders are too small, when they become unnecessary, the cylinders being readily lifted. Two doors opposite each other are also formed in the bottoms of each of the upper cylinders, by which easy access is obtained for examining or overhauling the metallic packing rings of the piston rods. Sufficient space is obtained for these doors without adding to the total height of the engine by the peculiar construction of the pistons. The pistons are of a single thickness of cast steel, of conical form, the apices of the cones of the upper and lower cylinders being turned outwards towards each other, and the ends of the cylinders being made to correspond. The upper cylinders have piston valves, and the lower cylinders double ported flat valves of the ordinary kinds, the piston and the slide valves for each pair of cylinders being contained in the same casing. This type of engine is especially suitable for the conversion of existing "compound" engines into "quadruple," the lower parts of the engines, crank shafts, &c., remaining the same, only new cylinders and new valves being requisite. From the following table it will be seen a number of vessels' engines have been altered in this manner by Messrs. Denny and Co., and a

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larger number of new vessels have been fitted with Brock's patent quadruple-expansion engine, including several of the largest steamers of the British India fleet, of the British and Burmese Steam Navigation Company, and of the Campania Transatlantica.

It might have been thought that the regularity of working two-crank quadruple-expansion engines would not have been equal to that in the three-crank triple-expansion or compound engines, but we are informed in Brock's patent engines, owing to the superior compression in the high pressure cylinder, they are as uniform in their action as three-crank engines. Although the highest steam pressure that has hitherto been adopted by Messrs. Denny & Co. is only 180 lbs. per square inch, and but slightly in excess of the pressure usually used in triple-expansion engines, a saving in coal consumption of from 6 to 8 per cent. has been obtained, as compared with triple-expansion engines.

BROCK'S PATENT QUADRUPLE-EXPANSION ENGINES. NEW VESSELS.

Name of Vessel.	Diam. of Cylinders. ins.	ins.	ins.	ins.	Stroke. ins.	Steam pressure. lbs.	Date of build of Engines.
Jumna	30	42	60	84	60	160	1886
Landaura	24	34	48	68	48	160	,,
Pekin	23	35	46	67	72	160	1887
Canton	23	35	46	67	72	160	,,
Pukaki	16	24	32	47	36	170	,,
Buenos Aires ...	32	46½	64½	92	60	170	,,
Lindula	24	36	48	70	48	180	1888
Brahmin	12½	18	24½	34½	42	160	,,
Rajput	12½	18	24½	34½	42	160	,,
Khatri	12½	18	24½	34½	42	160	,,
Monowai	12½	18	24½	34½	42	160	,,
Baroda (twin paddle)	14½	22	29½	42	48	160	,,
India ,,	14½	22	29½	42	48	160	,,
Pegu	25½	38½	51½	75	51	180	1889
Monte Video ...	32	46½	64½	92	60	180	,,
Megna	16	24	32	47	36	170	,,
No. 361 twin paddle ,, 362 ,,	14½	22	29½	42	48	160	,,
Rotokino	18	27½	36	53	39	180	1890
**Taviuni*	18	27½	36	53	39	170	,,
No. 372 ... ,, 373 ...	24	36	48	70	48	180	,,
,, 374	32	46½	64½	92	60	180	,,

* This vessel is being fitted with Howden's system of forced draught.

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OLD VESSELS WHOSE ENGINES HAVE BEEN OR ARE BEING CONVERTED INTO BROCK'S PATENT QUADRUPLES.

Name of Vessel.	Diam. of Cylinders.				Stroke.	Steam pressure.	Date of conversion.
	ins.	ins.	ins.	ins.	ins.	lbs.	
Tenasserim	24½	37	49	72	42	180	1887
Martaban	21½	32	49	72	42	180	1888
Irrawaddy	21½	32	49	72	42	180	1888
Phœnician	19½	27½	39	55	42	170	1887
Kronprinz Fredk. Wm.	21½	30½	43	61	48	170	1887
Pautah	19½	27½	39	55	36	160	1888
Africa	21½	32	43	62½	42	180	1889
Ethiopia	21½	32	43	62½	42	180	1889
Canara	19½	29	39	56½	42	180	1890
Goa	19½	29	39	56½	42	180	1890
Aurora	22½	33½	45	64	39	165	1889
Espero	22½	33½	45	64	39	165	1889
Duke of Westminster ...	25½	38	51	73	54	180	1890

Messrs. Rankine & Blackmore, of Greenock, have also in their design adopted the tandem arrangement, their principal distinctive feature being what is briefly termed disconnective, viz., that each pair of cylinders can in an emergency, or otherwise, be worked as an independent engine, by merely opening and closing the requisite valves on the steam-pipes. This arrangement is evidently of great value, as, in case of a breakdown, the vessel might still make progress while the necessary repairs were being made. In this design of engine the objectionable stuffing-box arrangement, already referred to, has been obviated by abolishing the stuffing boxes in the two upper cylinders, and substituting brass flanged tubes which dip down into the stuffing boxes beneath on the top of the lower cylinders. Arrangements have also been made in the design, which we need not detail, whereby the lower pressure cylinders are rendered easy of access. The first vessel fitted with the patent disconnective quadruple-expansion engines was the screw yacht *Rionnag-na-Mara*, in which, in order to obtain very slow speed for fishing, the disconnective principle was carried out very fully by having three pairs of cylinders, working three cranks. Three of the cylinders were for high-pressure steam, and were placed respectively on top of the first and second intermediate pressure, and

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on the low-pressure cylinders. (In our next table will be found the sizes of these engines and others since constructed.) Steam at 180 lbs. pressure is supplied from the boiler, but on trial the valves were set to blow off at 170 lbs. Under these circumstances, and under the supervision of Mr. Andrew C. Heron, Lloyd's engineer, surveyor of the district, a careful consumption trial was conducted, with the result that it was found only 1·125 lbs. of Welsh coal was consumed per I.H.P. per hour. Other three vessels have been since fitted with disconnective quadruple engines, but having only four cylinders; and in one, the *Falls of Inversnaid*, forced draught on the cold air ashpit system was fitted, while the sister vessel, *Holyrood*, has to depend only on natural draught. At sea, fully loaded with 4,100 tons of coal, and the engines probably indicating 900 I.H.P., the consumption per diem for the former vessel of a moderate quality of steam coal is 14 tons; and in the latter it appears to be about 15 tons, which it may incidentally be remarked points to a saving of 7 per cent. in coal consumption by the adoption of forced draught.

RANKINE'S PATENT DISCONNECTIVE QUADRUPLE-EXPANSION ENGINES.

Name of Vessel.	Diam. of Cylinders.				Stroke.	Steam Pressure in lbs. per square inch.	Date of Building Engine.
	ins.	ins.	ins.	ins.	ins.		
Rionnag-na-Mara ...	7	16	22	34	24	180	1886
Myrtle (built in 1869)	12	17	24	34	24	180	1887
Falls of Inversnaid...	18	26	36	52	39	180	1888
Holyrood	18	26	36	52	39	180	1889

The Central Marine Engineering Co., West Hartlepool, now merged in the firm of Messrs. Wm. Gray & Co., Limited, are also amongst the engineering establishments which have contributed their quota to the number of quadruple-expansion marine engines. So far they have only converted one set of engines, viz., in the s.s. *Suez*, owned by Messrs. Nelson, Donkin & Co., Newcastle, in which

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vessel the old crank shafts and engine-bed were utilized, new cylinders, respectively 22 ins., 30 ins., 43 ins., and 62 ins. in diameter, 45 ins. stroke being fitted in tandem fashion, working the two cranks. The working pressure of the new boilers was 160 lbs. per square inch, and the regular consumption of fuel at sea, of ordinary coal, 15 tons per diem. The manager of the Central Marine Engineering Works, Mr. Thomas Mudd, is, however, of opinion, that it will never become the general practice to build quadruple engines on two cranks only, as the experience now gained with the three-crank triple-expansion engine satisfactorily proves that a given ship can be driven the same speed with a three-crank engine on much less horse-power than with a two-crank engine. To adopt quadruple-expansion, and have only two cranks would be thus, in a measure, a retrograde movement. Mr. Mudd has accordingly designed and patented a quadruple-expansion engine, in which there are three cranks, it mainly differing from the triple-expansion engine in having a smaller cylinder for the high-pressure steam above what in an ordinary triple engine is the high-pressure cylinder. It may be remarked that in all engines of the popular type constructed at the Central Marine Engineering Works, the high-pressure cylinder is in the centre of the entire engine, in order to reduce radiation, and for converting triple-expansion engines into quadruples, it is evident that Mr. Mudd's design has considerable merits. The details have been carefully matured, and had not the present "boom" in shipbuilding occurred, leading to the very rapid construction of ships and engines of existing models and patterns, it is more than probable, ere this, several of Mudd's patent quadruple engines would have been constructed.

As many of our readers will be aware, for the smaller class of work—*e.g.*, steam-launches—up to about nine years ago, the old-fashioned type of high-pressure engine continued to be almost exclusively used. Messrs. Simpson and Dennison—now Simpson, Strickland and Co., of Dartmouth—were pioneers in introducing the simple form of tandem compound surface-condensing engine; and they are now likewise to the front in adopting the quadruple-

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expansion type, having, during the last two years fitted a large number of launches of various dimensions with their Kingdon patent quadruple-expansion engines. Two different sized engines of this type, and a duplicate set of the smaller size, fitted in a steam launch, afloat in the River Seine, were exhibited by the firm at the Paris Exhibition, and were the only full-sized quadruple-expansion engines exhibited. They are of the tandem type, but a stuffing-box between the cylinders is dispensed with, the upper piston-rods having rectangular grooves, to prevent any passage of steam from the high to the low-pressure cylinder on the up-stroke. On the down-stroke the steam passes from the bottoms of the upper to the top of the lower cylinders, and leakage past the piston-rod is of no consequence. This arrangement has, we understand, always given satisfaction. The coal consumption in such small craft is difficult to tabulate, owing to the high speed of revolutions, 500 per minute, not permitting of reliable indications of horse-power, but a careful estimate places it at 1·25 lbs. per I.H.P. per hour; and the continued demand for this special class of engine tends to show that they are economical in working. The steam pressure adopted by Messrs. Simpson, Strickland & Co., is 175 lbs. per square inch, raised in Kingdon's patent boilers, in some instances by forced draught closed ashpit, and in others by natural draught. Evidently this firm is enterprising and determined to be abreast of the times.

Messrs. Fleming and Ferguson, Paisley, constructed their first set of quadruple-expansion engines in the year 1887, for the steam yacht *Grace Darling*. These were of the tandem type, with two cranks, indicating 355 horse-power, the cylinders being respectively 10 ins., 14 ins., 20 ins., and 28 ins. diameter; 20 ins. stroke. In the following year the steam dredger, *Velez Sarsfield*, and in the last year (1889), the steam dredger *Valentine Alsina*, were fitted with engines of the identical sizes, in both instances the working pressure of the boilers being 160 lbs. per square inch; the power at full speed, viz., 150 revolutions per minute, being 355 I.H.P. As the pressure of steam employed is not in excess of what is very commonly adopted in triple-expansion engines, it must be admitted the coal consumption of 1·2 lbs. per I.H.P. per hour is very

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satisfactory. Messrs. Fleming and Ferguson, however, now prefer to construct their patent quadruple-expansion engines, of which in the year 1888 they turned out three sets, and in the following year ten sets, besides having others in process of construction.

As Fleming and Ferguson's Patent Quadruple-Expansion Engines are a notable departure in marine engineering design, a detailed reference is necessary. Unlike the ordinary quadruple-expansion engines, they are not tandem, but have all the four cylinders on the same plane, with two piston valves in the centre of the group. Two of the cylinders are placed on the port-side of the crank shaft, and two on the starboard-side, all standing vertically, and supported by two cast-iron columns on the condenser and two malleable iron columns in front. Between the cylinders are the valve casings, in which the piston valves work, there being one valve for Nos. 1 and 2 cylinders and one valve for the remaining pair. This makes a compact arrangement, but accessibility has not been overlooked, as the covers of the cylinders and valve casings are all independent, and there is nothing to move in getting at any of the covers. The valve motion is simple, two eccentrics only being required for either a-head or a-stern gear for all the four cylinders. The connecting rod is novel; it is a steel casting of triangular pattern, each angle of the base taking a piston rod, and owing to the angle of the connecting rod, when the stroke of the cranks is 36 ins., the stroke of the cylinder is 42 ins. The apex of the triangular connecting rod is attached to the crank, and the base at its centre is connected to a lever working off the back column, the lever being also utilized for working the feed, air, circulating, &c., pumps. There are thus only two cranks on the crank-shaft, and these are directly opposite to each other, making the balance of working parts at least equal to that of a three-crank engine, while the action of this engine in its working parts is equal to four cylinders placed in line on four cranks at right angles to each other.

In a table we give the leading particulars of the patent engines of this type that have been constructed by the patentees and makers.

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Fleming and Ferguson's Patent Quadruple-Expansion Engines.

Name of Vessel.	Diam. of Cylinders. ins.	ins.	ins.	ins.	Stroke. ins.	Steam pressure. lbs.	I.H.P.	Date of build.
Skean Dhu... ...	7	9	13	18	12	160	130	1888
Singapore	24	30	40	60	36	160	1650	,,
Sophia	9	12	18	25	22	160	330	,,
Carlotta and other light vessels	9	12	18	25	22	160	330	1889
St. Fergus	13	18	25	36	30	160	570	,,
Building	22	30	40	60	36	160	1650	1890
,, (twin screw)	13	18	25	36	30	200	570 ea.	,,
,, ...	17	25	34	50	33	160	1000	,,

It will be observed that in all but one instance, the working pressure of steam adopted is 160 lbs. per square inch, a pressure commonly employed in ordinary triple-expansion engines, and both on trial-trip and voyages the coal consumption results favour the contention of the makers that whatever the working pressure of steam may be, they obtain in their quadruple engines better results at that pressure than it is possible to realize from a triple-expansion engine. On a steam trial of the *Singapore*, under the supervision of Mr. James Mollison, the chief engineer surveyor at Glasgow for Lloyd's Register of British and Foreign Shipping, the consumption was found to be only 1·121 lb. per I.H.P. per hour, and in another steamer, on the passage out to Buenos Ayres, a similar result, viz., 112 lbs. per 100 I.H.P. per hour was obtained. Comparing this result with the data of the tandem quadruple-expansion engines, constructed by Messrs. Fleming & Ferguson, and it is apparent there is a reduction of 6·66 per cent. in the coal consumption by the adoption of their latter design. That some gain in coal economy should be attained is evident, owing to the decreased condensation, as the greater part of the heat of the cylinders given off by radiation is re-absorbed owing to the grouping of the cylinders in one plane. There are other advantages obtained as compared with triple-expansion engines. The vital parts are fewer, *e.g.*, there are only four as against six

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main bearings, two as against three crank pins, and two as against six eccentrics in the usual design of triple-expansion engines. In common with tandem quadruples, less fore-and-aft space is required for the engine-room, but special features are the reduced vibration due to the weights being kept low, the breadth of the base of the engines, and the better division of power in revolving the crank shaft. Owing to the arrangement being equal to four right-angle cranks the engine can be readily started, stopped, or reversed; and in case of accident to either of the forward pair of cylinders or to their crank, necessitating disconnection, the after-engine can be driven as an ordinary compound-engine, the action of the after-pistons on the crank being exactly equal to that of a compound-engine with the cranks at right angles, minus the difficulty there would be in starting tandem-placed cylinders or a single cylinder on one crank.

Messrs. Laird Bros., Birkenhead, the well-known shipbuilders and engineers, have recently entered the field as manufacturers of this latest type of marine engines, having "converted" the engines of the s.s. *Sicily*, owned by Messrs. David McIver & Co., from ordinary double compound to quadruple compound, this being effected by placing two new cylinders tandem fashion, with their piston valves, rods, and connections complete, on the top of the old cylinders, which were not moved from the vessel, a liner being fitted in the low pressure cylinder, so as to reduce its diameter to the power required. The old cylinders were 35 in. and 60 in. effective diameters, the new arrangement 17½ in., 25¼ in., 35 in., and 50 in.,—the stroke, 42 in., remaining the same. A cylindrical boiler, of 180 lbs. per square inch working pressure, large enough for the power required ordinarily, but fitted with forced draught on the closed ashpit system, in case greater power should be desired, was substituted for the two original 65 lb.-pressure boilers. The weight saved in the engines and boilers together with the expected fuel economy of probably about twenty per cent. as compared with the old compound engines, considerably increases the *Sicily's* useful deadweight capacity. As the trial trip was unavoidably hurried, the vessel proceeding direct to sea, exact *data* is not

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available, but the results appeared satisfactory. The vessel is at present on her first voyage with the new engines.

Messrs. William Allan & Co., Scotia Engine Works, Sunderland, has patented a design of a quadruple-expansion engine, in which there are, as in Mudd's patent, three cranks; but instead of placing the high pressure cylinder tandem fashion on the high intermediate pressure cylinder, these cylinders are placed abreast of each other on the port and starboard-side of the centre line, by a cross-head arrangement, the two piston rods actuating one connecting rod. Four sets of quadruple engines have been fitted to new steamers during the year 1889, and two steamers, the *Meath* and the *Tunis*, have had their old "compounds" converted into "quadruples," and the results in the former steamer have been reported to be very satisfactory.

As has already been indicated, one of the important incidental advantages obtained in the triple-expansion engine in the now universally adopted tri-crank type was increased ease of manipulating the machinery in starting and smoothness in working. If three cranks placed respectively at angles of 120 degrees was an improvement upon the two-crank engines, it naturally follows that four cranks at angles of 90 degrees respectively will increase the uniform turning of the shafting, and ease in starting and stopping at any position. Mr. John Tweedy, one of the partners of the firm of Messrs. Wigham, Richardson and Co., Newcastle-on-Tyne, has accordingly patented a four-crank quadruple-expansion engine, which, in addition to the main feature already alluded to, has great simplicity of design and accessibility of parts. The first engines of this type—four-crank quadruple-expansion—were constructed during the year just closed (1889) and fitted in the new steamer *Fonar*, both engines and hull being built by Messrs. Wigham, Richardson and Co. The engines consist of 21 ins., 29 ins., 42 ins., and 60 ins. respective diameters of cylinders, 42 ins. length of stroke, and the working pressure of steam is 180 lbs. per square inch, the engines making 75 revolutions at full speed with loaded ship, and indicating 1,590 horse-power. The crank shaft is supported in six bearings, and advantage has been taken of the fact that the cranks are opposite each other in pairs, to simplify the valve gear of the

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engines. The gear is of the Stephenson link-motion type, and three sets of gear are made to actuate the four engines. On the trial trip the vessel attained a speed of nearly 13½ knots, with a boiler pressure of 173 lbs. per square inch. The power was remarkably uniform in all the cylinders, viz., 403 in the high pressure, 413 in the first intermediate, 427 in the second intermediate, and 445 in the low-pressure cylinders, or 1,688 in all, while the range of temperature was exceedingly low, being 58° Fahr., 58°, 62°, and 51° respectively. We regret that we are not in a position to give the coal consumption, but understand the results attained have been far beyond the makers' expectations.

It has been objected to the special type of engine fitted in the *Fonar* that a greater portion of the length of a steamer is required for the engine-room, but this, after all, may be quite an unimportant matter, especially in vessels of considerable beam, as the available spaces on the port and starboard sides of the engine-room are utilised for coal bunkers, and the greater the capacity of side bunkers the less length of the vessel is required to be absorbed by the cross-bunker. Possibly, an objection to the increased number of working parts and wearing surface is of greater force, but no doubt even this objection is minimised, if not removed, by the greater freedom from any approach to abruptness in the working of the engine.

In closing this necessarily brief and cursory examination of the development of the quadruple-expansion engine, we think it will be evident to our readers that there is quite a "battle of designs," and as there appears some probability that quadruple-expansion engines will in time supersede both triple and compound engines, the law of the "survival of the fittest" will once more be exemplified.

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SHIPPING LAW.—FINAL JUDGMENTS.

N the present occasion we have three very interesting "final judgments" to lay before the readers of the *Nautical Magazine*, two in the House of Lords, one of which determines the proper measure of damages in a collision case, and the other a very moot point in the Rule of the Road at Sea; and the third in the Privy Council on the Law of Contribution for Jettison.

(1.) *Owners of s.s. Gracie* v. *Owners of s.s. Argentino.* The *Argentino*, 14 App. Cas. 519.—This case arose out of a collision between the *Gracie* and *Argentino* in the Thames, on 20th February, 1887. It was agreed by the parties that both vessels were to blame, and the accounts had to be settled in the Admiralty Registry, on the well-known principle of the Admiralty Court (and, since the passing of the Judicature Act in 1873, of all English Courts), that where both vessels are to blame for a collision, each recovers half her damages from the other; or except where the question is complicated by a limitation of liability (see the case of the *Khedive*, *Nautical Magazine*, 1883, p. 119) what comes to the same thing, that the lesser damage is deducted from the greater, and the person who has sustained most damage recovers half the balance of the account from the person least damaged.

The *Argentino* brought in her claim, consisting of a large number of items, but with only two of which we are concerned. These are as follows:—

(16.) "Loss of profit on succeeding voyage, which had been contracted for, but which the defendants were unable to carry out, and for which another steamer was substituted, including eight days' time lost in loading cargo upon next voyage beyond the time which would have been consumed in loading the cargo originally contracted for—£785 16s. 5d."

(17.) "Demurrage of the s.s. *Argentino*, 1,427 tons gross, for 19 days, at 5d. per ton per day, £564 17s. 1d."

The Registrar, after hearing the evidence, and finding that there was no charter party, but only a verbal agreement for the voyage,

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the loss of profits on which was claimed for in item (16), disallowed that item altogether, as being too shadowy, problematical, and remote, and allowed just half the sum claimed in item (17) for demurrage. The owners moved the Admiralty Division in objection to this report, and the motion was heard by Sir J. Hannen, the President, on January 31st, 1888, judgment being given on February 14th. It is not necessary to go into the details of his judgment, suffice it to say that he considered under the particular circumstances of the case that, in assessing the damages, the agreement for future employment should be taken into consideration. From this decision the owners of the *Gracie* appealed, and the appeal was heard on the 17th and 29th of May, 1888, judgment being reserved, and given on August 9th, when Lords Justices *Lindley* and *Bowen* substantially, though not exactly, agreed with the view taken by the President, whilst Lord Esher, the Master of the Rolls, on the other hand, considered the Registrar's view to be correct. With such a divergence of judicial opinion it was almost necessary that the question should go before the final Court of Appeal, and accordingly the owners of the *Gracie* again appealed to the House of Lords, where the case was heard on the 26th and 29th of July, 1889, by Lord Herschell, Lord Fitzgerald, and Lord Macnaghten, who, on the 9th of August, delivered judgment unanimously confirming that of the majority of the Court of Appeal. It becomes now necessary to state with precision what was the nature of the agreement for the subsequent voyage in respect of which the claim in item (16) was made. Quoting from the judgment of Lord Herschell, he says: "The facts were not in dispute." . . . . "Ten days prior to the collision, whilst the *Argentino* was at sea on a voyage from Sebastopol, it was arranged between Messrs. W. &. L., shipbrokers, who collect cargo at London and Antwerp for conveyance to the Black Sea, and the managing owner of the *Argentino*, that as soon as that vessel had arrived and discharged her cargo, she should proceed to Antwerp and load for the Batoum route. In consequence of the collision the *Argentino* could not keep her engagement, and W. & L. had to procure another vessel. Immediately after the repairs of the *Argentino* were completed, she left for Antwerp, having been engaged some

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days before that date to proceed to Odessa *viâ* Antwerp and London." He then proceeds to lay down the rules of law applicable to such a case, and says: "If at the time of the collision the damaged vessel had obtained such an engagement for an ordinary maritime adventure, the loss of the fair and ordinary earnings of such a vessel on such an adventure appears to me to be the direct and natural consequence of the collision;" and therefore on ordinary principles of law the claim is not too remote to be recoverable. He then proceeds to deal with the other item—the demurrage—and points out that what is usually called demurrage in damage cases is an allowance for the loss of the probable earnings of the vessel where no express agreement was in force, and that therefore, when, as in this case, the loss of profits under an agreement is set up, the shipowner cannot claim such demurrage in addition; and then, still further lays down that the profits actually made in the substituted voyage to Odessa, during that portion of it which would have been occupied in the Sebastopol voyage must be set off against the profits claimed to have been lost by the loss of the latter voyage. The case is interesting as a guide to shipowners, and, perhaps, still more to their legal advisers, as to the best way to shape a claim before the Registrar and Merchants. Probably, unless freights are very rapidly falling, it will be found easier to take what you can get by rule of thumb, 2d. or 3d. per ton per day, rather than set up such an elaborate calculation as that required to work out the judgment of the House of Lords; and still more probably when the successful appellant from the Registrar's original decision comes to set off against anything he may have gained by the calculation, the extra costs he will in spite of his success have to pay, he will find he has won indeed a barren victory. We have given only the necessary extracts from Lord Herschell's judgment, but the full text of it should be looked at by shipowners themselves; it is so clear and concise in language, and so convincing in logic, that it requires no interpretation by a lawyer, nor will it well bear any condensation.

(2.) *The Owners of the Steamship Lebanon* (*Appellants*), *and the Owners of the Steamship Ceto* (*Respondents*). 14 App. Cas. 670.—This case decides the duty of steamers approaching one

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another in a fog. The collision occurred about 3 a.m. on the 20th August, 1886, in a dense fog, off Whitby.

Before either vessel began to manœuvre for the other, the *Lebanon* was heading about S. by E. ½ E., and making, it was alleged, 2 knots an hour; the *Ceto* N. by W. ½ W., and making about 2½ knots. The *Lebanon's* case was that she heard the *Ceto's* whistle on her starboard-bow and starboarded to S.E. and steadied, and hearing a two-blast signal from the *Ceto*, proceeded till the masthead and red lights of the *Ceto* came in sight two or three points on the starboard-bow, and about a ship's length off, when the engines of the *Lebanon* were reversed full speed. The *Ceto's* statement was, that hearing the whistle of the *Lebanon* broad on her port-bow, she ported a little and gave one blast of her steam-whistle, and when afterwards she several times heard the whistle of the *Lebanon* on the port-bow, she on each occasion ported a a little more, and gave one blast, and when she had thus ported about three points she saw the masthead and green lights of the *Lebanon* come into view about four points on the port-bow about 60 yards off, that she was then hailed to go full speed ahead by the *Lebanon*, and did so, and put her helm hard a-port. The parts of the vessels which first came into contact were the stem of the *Lebanon* and the port quarter of the *Ceto*. The *Ceto* sank directly, and the *Lebanon* was seriously injured. The owners of the *Lebanon* thereupon sued the owners of the *Ceto* for the damage they had sustained, and the *Ceto* counterclaimed for the loss of that vessel. The case was tried by Sir J. Hannen, President of the Probate, Divorce, and Admiralty Division, assisted by Elder Brethren of the Trinity House, in November, 1884, when he found the *Lebanon* alone to blame, finding that the vessels in the first instance were meeting end on, or nearly so, that the *Ceto* was going as slow as she possibly could, and was right to port as she did; and that, even if her steam-whistle signal had been misinterpreted, and therefore the *Lebanon* was justified in the first instance in starboarding to it, yet that from the direction of the subsequent sounds of the *Ceto's* whistle, she should have found out her mistake sooner, and ought to have stopped sooner than she did. From this decision the owners of the *Lebanon* appealed, admitting in the appeal that they

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were to blame, but claiming that the *Ceto* was also to blame. The appeal was heard by Lord Esher, Master of the Rolls, Lord Justice Bowen and Lord Justice Fry, assisted by nautical assessors, who delivered judgment on March 29th, 1887, affirming the judgment of Sir James Hannen, that the *Lebanon* was alone to blame; finding that the *Ceto* was going at a moderate speed, and so obeyed Art. 13, and that when the *Lebanon* came in sight she was wrongly under a starboard helm, and that until she came into sight the *Ceto* had no indication from her which rendered it "necessary to stop and reverse," and that the best thing she could do then was to go full speed ahead. The owners of the *Lebanon* were not yet satisfied, however, and appealed again to the House of Lords, where the case was heard on May 14th and 15th, 1888, by Lord Halsbury, L.C., Lord Selborne, Lord Watson, Lord Fitzgerald, and Lord Macnaghten, and at their lordships' request was reargued on the 1st and 2nd April, 1889, Lord Bramwell and Lord Herschell being also present at the second hearing, when judgment was reserved, and on July 1st judgments were delivered by Lord Halsbury, L.C., Lord Bramwell, Lord Herschell, Lord Watson, and Lord Macnaghten, reversing the decision of the Courts below so far as the *Ceto* was concerned, and finding both vessels to blame, whilst Lord Selborne and Lord Fitzgerald delivered judgments supporting the views of those tribunals. The judgment of the majority in the House of Lords stands as a final decision of the point. The basis of the decision of the majority of the learned Lords being that when two vessels are in a fog, and approaching one another, they fall within the latter part of Art. 18, and it is "necessary" for each "to stop and reverse," unless from the sound of the whistles it is obvious that the vessels are passing clear, or that it is for other reasons dangerous to stop and reverse, and that, the hearing of the whistle of the *Lebanon* persistently on the port-bow of the *Ceto*, and not getting abeam notwithstanding the porting of the *Ceto's* helm, ought to have shown those on board the *Ceto* that there was risk of collision continuing, and that she was therefore bound to stop and reverse. The case is interesting in the first instance for the divergence of Judicial Opinion. The President of the Admiralty Division, the Master of the Rolls and

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two Lords Justices in the Court of Appeal, assisted together by four Nautical Assessors, and supported by an Ex-Lord Chancellor and one Lord of Appeal in Ordinary, a total of six Judges and four Nautical Assessors being overruled by the five Judges, consisting of the Lord Chancellor, an Ex-Lord Chancellor, an Ex-Lord Justice and two Lords of Appeal in Ordinary without Assessors. Had the case not been reargued in the House of Lords, it would have been even more remarkable, as both the Judges who heard only the second argument were in the majority at the final decision, and without them the six Judges and the four Assessors would have been overruled by three, the Lord Chancellor and two Lords of Appeal in Ordinary; and had the Lord Chancellor been sitting in the Court of Appeal and the Master of the Rolls in the House of Lords, as might have happened, both Judges being members of both tribunals, the final judgment would, if the two additional peers had not been called in, have been the other way.

There is, however, but little to comment on in the judgment. In a fog it is your duty to go at a moderate speed. What is a moderate speed depends upon the locality more than anything else, and hearing a whistle anywhere ahead it will be wise to go at once as slow as possible; but if the locality is such that vessels are probably steering on nearly opposite courses, there will be no harm if the whistle is ahead or on the port-bow in porting; but on hearing a second whistle from the same vessel, unless it is broad on the bow, you are within the second part of Rule 18, as interpreted by the final Court of Appeal in this case, and are bound to bring your ship to rest at once.

There are, however, a few observations that may be made on the subject outside the limits of the judgment. (1.) What is a moderate speed in a fog? Probably an ocean tramp of 99 horse-power nominal, and with a cargo of 2,000 tons of coal or thereabouts, will, if she is going say half speed, be making about 4 knots; but with the momentum of that weight of ship and cargo will not, if she does her level best by reversing full speed, actually get sternway for two minutes or more, whereas a high-powered lightly built and lightly loaded paddle-wheel passenger steamer, such as

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the Dover and Calais, or Holyhead and Kingstown boats, will, when going full speed, or something like 20 knots an hour, by reversing be brought to a standstill in about twenty seconds. Perhaps the test is—a moderate speed is such that a vessel can on hearing a whistle or fog-horn of ordinary power for the second time bring herself to rest before she has traversed half the distance between the two vessels. Now, suppose a fog-horn of ordinary power can be heard one mile, a liberal distance, the sound is to be made at intervals not exceeding two minutes. In the extreme case, two vessels approaching may have sounded their fog-horns when just out of hearing range, and, therefore, neither will hear the other till two minutes have elapsed with the vessels within hearing range, nor will they hear the second whistle each of the other till they have been four minutes within hearing range. Now if each vessel were originally going 6 knots an hour or 1 knot in 10 minutes, she would in two minutes before hearing a whistle have traversed about 1,200 feet; the two vessels together, 2,400 feet, or the vessels will be $\frac{2}{3}$ths of a mile apart; if they both ease down or better reduce their speed by stopping, at the end of another two minutes,—taking an average vessel,—the speed will probably be nearly all off; or, they may be taken to have averaged 3 knots each during this period, in which case they will be still $\frac{2}{3}$ths of a mile apart, and both at rest, each able to form a judgment of the position of the other vessel, and in a very short time, by giving helm signals, will pass in perfect safety; whereas, whatever the initial rate may be, even if only two knots, and each vessel keeps going on, there is no safety at all. It is also obvious that, without justifying the paddle-wheel passenger steamer going at full speed in thick weather, if on hearing the whistle or fog-horn of another ship, she at once take steps to reduce her speed, that is, in her case, by reversing her powerful engines, she can safely navigate—safely both with regard to herself and other vessels—at a much higher speed than ordinary vessels. Say she is brought to rest in half-a-minute, and was previously going 20 knots an hour, her average speed during that half-a-minute is 10 knots an hour, or she will have travelled 500 feet only.

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A nother consideration arises also on this as on many other cases with regard to the modifications proposed in the Rule of the Road at Sea, by the Conference at Washington. *Inter alia*, it is announced to have been decided that where a vessel has at present to keep her course, she is also to keep her speed, presumably not to embarrass the vessel which has waited till the last moment to alter her course by stopping in her way. To obey the new rule will be trying to the officer's nerves when he sees his opponent; but if it is to apply in fogs, it will be like sailing over torpedoes.

It is also worth noting that the House of Lords has read the Art. 18 as if it were identical in form with the earlier part of the old Art. 16 of the Regulations of 1863, where the words "if necessary" came before "stop and reverse," and not after them as in the present rule: under the old rule there could be no doubt that the "if necessary" governed "stop and reverse," and these words only. Why the alteration was made into the present ambiguous form, it is difficult to understand, as until this case was decided it was doubtful if the words "if necessary" governed "reverse" only, or "stop and reverse," or "slacken her speed or stop and reverse," and one can only conjecture that the alteration was made from the good plain English of the 1863 rules into the present form to adapt it to the idiom or form used for the rule in the foreign versions. However it may be now deemed to be settled that the alteration in form has made no alteration in substance.

(3.) *Strang, Steel & Co.* (*Appellants*) v. *A. Scott & Co.* (*Respondents*), 14 App. Cas. 601.—The appellants were the agents at Rangoon for the steamship *Abington*. The respondents were the consignees of some of her cargo. The vessel in the course of a voyage from London to Rangoon negligently got ashore in the Gulf of Martaban, and had to jettison cargo. On the vessel's arrival at Rangoon the agents demanded a deposit from the consignees, "against probable average claim," before they would deliver cargo. After some correspondence and negotiation the respondents deposited the required sum, amounting in this case to Rs. 1,592·11 under protest, and after getting their goods delivered sued to recover the amount deposited. There were

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other points in the case, but the only one actually material was that they were not liable to contribute to general average for a jettison caused by the negligence of the master. The bills of lading were in what may now be called the ordinary high class steamship form, containing, amongst other numerous exceptions, "any act, neglect or default whatsoever of pilot, master or crew in the management or navigation of the ship." The case was twice tried before the Recorder of Rangoon, who found for the respondents, and against his decision the ship's agents appealed to Her Majesty in Council. The appeal was heard on the 31st January and 1st February, 1889, by Lord Watson, Lord Fitzgerald, Lord Hobhouse and Lord Macnaghten, who reserved judgment, which was delivered on the 1st August, 1889.

The appellants' contention was that an innocent owner of goods which were jettisoned had a right by the general maritime law to a contribution from the other owners of goods which had nothing to do with the terms of engagement between them and the shipowner contained in the bills of lading, and that the master or ship's agent, as the agent of all concerned, had a right to collect this contribution from all before surrendering his lien on the cargo by delivering it. The respondents, on the other hand, contended that when the jettison was occasioned by the negligence of the master, the owner of the cargo jettisoned had at common law a right to recover from the shipowner, and that there was in such case no general average contribution at all, and that if the cargo-owner had allowed the shipowner to contract himself out of his liability, this did not alter the relation between the several cargo-owners towards one another, or create any right to general average contribution. If the jettison had not been made, and in consequence the ship and cargo had been lost, the shipowner would have been liable by Maritime Law, apart from his contracts with each cargo-owner, to have made good the whole loss sustained by all, and therefore, in making a jettison when the ship has got ashore through his negligence, the master is acting as agent for the shipowner to minimise his loss, and not for the whole adventure, and therefore no general average claim arises from the act at all.

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The Court had little difficulty in deciding the question actually before them, holding that the maritime laws handed down to us from the time of ancient Rhodes, makes each innocent owner of goods jettisoned, by the fact of the jettison, a creditor of each owner of goods and of the ship which are saved for the amount of his loss, and entitles him to a general contribution from all to make it good; that it is the fact of the jettison for the good of all concerned, and not the reason of it, which are to be considered in the first instance. But the judgment further holds that a guilty person—that is, in this case, the owner of the ship—who was liable for the negligence of his servant—the master—cannot recover for any loss he may sustain in consequence of the jettison under the general maritime law, but left it an open question whether such an exception as appears in the bill of lading in this case would, under the circumstances of the case, give the shipowner a claim to contribution.

The point decided is important, but the one left is even more so, having regard to the present general form of steamer's bills of lading. No doubt it is competent to a shipowner so to draw his bill of lading as to specifically free himself from the liability, if it exists, to each cargo-owner; but as there is not, and cannot be, any contract between the cargo-owners *inter sese*, it must be a very serious question whether the ship does or does not contribute, as if by maritime law she does contribute, her value must be brought in to the average statement, though in adjusting the average no cargo-owner could recover the ship contribution by reason of these special contracts, which would result, if the cargo were not extrinsically valuable, in giving each but a small proportion of his loss.

SEA LAWYER.

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THE FRENCH BOUNTIES ON SHIPPING.

IN an article in a recent number of this Magazine on "Bounties on Shipping,"* with more especial reference to the premiums on construction and on running given for some years past by France, we gave figures showing the steam tonnage of Great Britain, the United States, France, Germany, Italy, Spain, and Norway, collected from Lloyd's Universal Register for the four years ending 1889, illustrating the stationary character of French shipping as compared with the large increases in tonnage of some other nations. These figures we thought tended to show the futility of encouragements to shipping of this nature. "If the bounty system," we said, "had availed to place the French Mercantile Marine in a good position, the results would have been shown in a regular increase year by year, until the payments became such a burden on the nation as to compel their discontinuance. In fact, State aid to an industry so large and so exposed to international competition involves two distinct difficulties. If after a term of years the bounty proves a failure, it must yet be kept up for fear of a total collapse. If it prove a success, its very success renders its continuance impossible, and then its withdrawal would also lead to collapse."

Our very able contemporary *Le Yacht* has recently been discussing the same question, and has reproduced our figures, and although we could hardly expect a periodical representative of the French shipping interest to agree with us as to the futility of bounties, *Le Yacht* is certainly at one with us as to their results up to the present. In an able editorial in the number for the 23rd November, *Le Yacht* traces the history of protection and free trade in France as regards shipping. It was in consequence of the *régime* of free trade inaugurated under the Empire in 1860, that in 1866 a law was passed which abolished finally from 1870 the *surtaxe de pavillon*, and thus opened the

* *Nautical Magazine*, September, 1889.

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trade of France from French ports to the unlimited competition of the world. The result of the law was complete consternation among shipowners, and so many complaints reached the Government, that in 1870 the Corps Legislatif ordered an inquiry, which, suspended during the war, was carried out and completed soon after, and then in January, 1873, the National Assembly re-established the *surtaxe de pavillon*. This, however, being found to be contrary to treaties of commerce then existing between France and other nations, was abrogated in the following July, and then was started an inquiry into the best means of preserving and assuring the prosperity of the Mercantile Marine. It was not, however, till 1881 that the bounty law was passed. After describing the payments made under it, which we also described in our former article, the writer gives the complete figures of sums actually paid under the bounty law. In the figures given by us, we stated on the authority of a consular report the estimated total for 1887 as 11,000,000 francs. The case is actually much worse than this, as will be shown by the figures which we give :—

Year.	Premiums paid on Construction.	Premiums paid on Navigation.	Total Premiums.
	Francs.	Francs.	Francs.
1881 ...	950,899	2,980,894	3,931,793
1882 ...	4,540,596	6,458,605	10,909,201
1883 ...	3,160,297	8,465,291	11,625,588
1884 ...	4,484,968	8,589,331	13,074,299
1885 ...	1,189,152	7,567,279	8,696,431
1886 ...	3,005,618	7,578,347	10,583,965
1887 ...	1,457,482	8,213,481	9,670,963
Total ...	18,729,012	49,853,228	68,582,210

The bounties paid on construction are, it is explained, to a large extent simply a return of import duties paid on articles intended for ship construction, since prior to 1866 drawbacks were allowed on such articles. This we can hardly admit, since if any of these articles are now manufactured in France no duty is paid on them, but the premium on construction is nevertheless paid to the ship-

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owner. The utmost we can grant is that part of the 18¾ millions may rather be considered as encouragement to the French iron and steel manufacturer than to the shipbuilder. *Le Yacht* concludes that the fifty million francs of the second column is what the nation has been called upon to pay for the encouragement of its mercantile marine. What then is the result? Published statistics show that in 1860, during the period of complete protection, the part taken by the French marine in the total foreign and colonial trade of the country (excluding fisheries distant as well as at home) was 42·69 per cent.; in 1869, when the *surtaxe de pavillon* was abolished, it fell to 37·21 per cent., and in 1880 it was more than 34·87 per cent. Under the operation of the bounty law the percentage rose to 37·14 per cent. in 1881, and thence steadily increased to 41 per cent. in 1887, but in 1888 dropped to 40·24 per cent. Sixty per cent. of French trade is, in spite of the bounties, still in the hands of foreign shipping. Further, the law of 1881 was only to last ten years, it being believed that this temporary assistance would set the French mercantile marine on its legs again, and then it could go on and successfully compete with the foreigner. So far from such being the case, however, the approaching end of the ten years period already has begun to injuriously affect French shipping. Many companies formed in 1881 and 1882 in view of the advantages assured them by the new law have either had to put themselves in liquidation or to reduce their capital, and no new enterprise can be commenced owing to the approaching stoppage of the bounties. Already in 1888 the French flag had lost 1 per cent. of the trade, that is, one-sixth of the total gain between 1880 and 1887. But our contemporary goes on to say, the shipbuilding industry of France is still more affected. Thanks to the bounties the tonnage turned out which had been only 18,470 in 1881 rose to 68,502 in 1882, and in the succeeding years the figures were 47,217, and 66,571. But in 1885, the figures were only 20,858; in 1886, 40,336, and in 1887, 21,629 tons. Figures of English shipbuilding it will be remembered show somewhat similar fluctuations, but with this important difference, that whereas English shipbuilding in 1888 showed a great revival of trade, in France it fell off.

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What then is the conclusion arrived at? That the system of bounties is a bad one, the temporary benefit to trade being slight, while it becomes increasingly difficult each year to go on without the stimulus it provides; and that consequently it would be better to allow the bounty law to lapse in 1891, and make a temporary sacrifice in order to place trade on a permanently healthy basis? No, the new Chamber is called upon to prolong the operation of the law of 1881, as the only means of putting courage into the hearts of French shipowners, and bringing back to shipping the capital which in the last year or two has been withdrawn from it.

The subject is farther pursued in an able article signed "Lisbonne," in *Le Yacht*, dated 21st December. This writer, in addition to the figures given in our former paper, states some interesting figures showing the gradual substitution of steam for sailing tonnage in France. One remarkable feature brought out is the small size of French sailing ships of the present day. Taking steamers of 100 tons and upwards the mean size per vessel is 1,510 tons, but of sailing ships of 100 tons and upwards it is only 266, and that in spite of the fact that the remarkable firm of Bordes & Co. possess a fleet of 32 sailing-ships of a mean tonnage of 1,320. But for this one house, the sailing tonnage of France would show a very considerable decadence.

Considering the case of steamers, "Lisbonne" goes on to say:—"We see progress all around us. In the four years of the Table,* the steam tonnage of the United States has augmented 4 per cent., that of Spain 10 per cent., that of England 11·2 per cent., Germany 20 per cent., Italy 46 per cent., and ours ·27 per cent. And if for these four years we withdraw from the account the tonnage of the Compagnie des Messageries Maritimes (specially subsidised), we find a decided decline. In fact, the fleet of the Messageries Maritimes was 150,000 tons in 1885, and 179,000 tons in 1888, and if these figures be withdrawn from the account, we find the remaining steam tonnage of France for 1885, 588,000 tons, and for 1888, 561,000, that is, a diminition of 4 per

* *Nautical Magazine*, September, 1889, page 719.

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cent. . . . From these figures we see that alone among the great nations, France sees her steam marine declining, the second place which it occupied in 1888 is lost in 1889. Shall it descend still lower? We know not. But it appears to us that one can only attribute this unhappy situation to the near approach of 1891, the year when the premiums for navigation are to cease. Many steam shipping companies have ceased to augment or to renew their material in the fear of creating unproductive capital. Notwithstanding the premium on construction, the principal French shipbuilding yards would have remained without work, and would have been compelled to reduce their staff if important contracts for government ships had not kept them going for the time. This is necessarily but a temporary relief."

It appears to us but too probable that arguments such as these will prevail, and that the failure of the bounty system will but lead to a further extension of it, and the difficulties which now stand in the way of its abandonment will certainly accumulate with every successive postponement of the evil day.

OCEAN CURRENTS.

WHAT is the cause or the combination of causes which produces the circulation of the ocean in the form of more or less permanent currents? Are those currents occasioned through the mechanical force of the winds driving the waters before them? Are they an effect of the difference in the temperature of the water, in consequence of which the cooler waters of the northern and southern latitudes are ever being attracted towards, and are ever invading the tropical regions—a regular interchange or flow and return of water between one region and another being thereby established? Or do they arise from the mode in which the ocean waters are affected generally, by the cosmical influence which appears to dominate the entire universe, and to which the name of Gravitation has been given?

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It is upon the last-mentioned hypothesis that the following observations are based.

Taking as our guide the information furnished by astronomical experts from Newton onwards, it is to be regarded as certain that it is to gravitation that the tides are primarily and directly due. Just as the earth with its satellite, is held to its course in its annual journey round the sun, by that force chiefly as exercised by that wonderful luminary, and as the moon is held to its course in its monthly journey round the earth chiefly by the earth's attractive force, so are the ocean waters primarily retained upon the earth by the force of the earth's gravitating power, but not being rigid as are the solid parts of our globe, they are the more amenable to the gravitating influence of the sun and moon, so that the earth's power over them is to some extent overcome by the attractive power of the two luminaries respectively. They are drawn out or "heaped up" towards the sun and moon and in the diametrically opposite parts of the globe, and hence, in combination with the earth's diurnal rotation upon its axis, daily tidal phenomena occur, with progressive and retrogressive semi-monthly and semi-annual alterations or variations in the manner indicated in the previous article upon the subject.

In connection with the causes whence tidal phenomena proceed, the local variation of the earth's gravity is a matter which invites consideration. That such power is not the same in all latitudes, and that it is less at the equator than at the poles, and increases in some ratio or proportion according to the increase of distance from the equator towards the poles, is a circumstance as to which astronomers furnish the proof and the scientific explanation, and it can hardly be otherwise than that it should have an important bearing upon the question, how are the established currents of the ocean produced?

Bearing in mind the origin to which the so-called tidal waves are due, and having regard to the fact that in the course of the earth's annual journey round the sun, the direction of the earth's axis in reference to the surrounding heavens does not become altered excepting to an extent which is almost inappreciable, and that the moon's monthly journey round the earth is in a plane

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which is always within six degrees of the ecliptical plane, a necessary inference follows from those circumstances, namely, that the tidal waves are permanently maintained upon the globe in such a way that, while they travel round the earth—the one in the course of the year, and the other in the course of each month—the vertex or deepest part of the one (the solar) is always somewhere in that circle round the earth of which the ecliptic in the heavens is the corresponding extension, and the vertex or deepest part of the other (the lunar) is always somewhere within six degrees of that circle.

Now, of course the diurnal rotation of the globe upon its axis causes every spot upon the globe to describe a circle which is parallel with the equator, and the equator or equatorial circle is *oblique* with that circle which, as just mentioned, corresponds with and lies under the ecliptic, and wherein or near whereto the deepest parts of the solar and lunar tidal waves are thus respectively situate. The equator crosses the ecliptical circle at an angle of 28° 28′, so that the deepest parts of the solar and lunar tidal waves are always nearly within that limit on one side or the other of the equator, and their depth is necessarily supposed to be in some degree graduated from their deepest to their shallowest parts. From this combination of motions and circumstances it manifestly ensues that a different parallel of geographical latitude is being ever brought under any one part and under every part of the tidal water. Therefore the tidal water is being subjected at every instant to a different degree or amount of terrestrial gravity from that to which it was subjected the instant previously.

It is a striking characteristic of liquids that they are most sensitively amenable to the influence of gravitation—that it is their constant effort to re-establish themselves in equilibrium whenever subjected to disturbance. The upper waters of the ocean are always being affected by such disturbing force exercised by the sun, and the moon, and the earth respectively. The Great Luminary, and our planet and its satellite, each of them, are ever progressively and retrogressively, in varying times and measures, tightening or partly relaxing their hold upon them. The waters are the subject of a ceaseless contest of more or less opposing

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forces, and their endless endeavour is to yield to the strongest and to strive after a state of restful equilibrium which they never do and never can attain.

For the purpose of considering what should be the effect of the local variation of terrestrial gravity through the diurnal rotation of the globe combined with the advance of the globe in orbit, let the matter be first dealt with in connection with the solar tidal water, or so-called wave. As previously stated, that wave travels round the earth once in the course of the year in such a way that its vertex, or deepest part, is always, so far as its interception by the land and other circumstances will permit, at that part of the globe over which the sun happens to be most nearly vertical. Hence, as the earth advances in its annual course, the wave, with its vertex so situate, is travelling either from or towards the equator, altering its position synchronously with the alteration of the sun's position in declination and celestial longitude. Starting from any time of the year—say the vernal equinox preceding summer in the Northern Hemisphere—the solar wave travels obliquely, but continuously in the direction in which the power of terrestrial gravity increases, until the earth has arrived at the part of its journey where the summer solstice occurs. During the same period (as at all other times) the solar wave is said to have its counterpart in the opposite hemisphere, which is similarly travelling obliquely in the direction in which the power of terrestrial gravity increases. What *must* ensue from that state of circumstances? Plainly this, that the tidal water—that is to say, the part of the ocean waters which the sun attracts towards it—will yield more or less to the increasing power; it will strive to adjust itself in equilibrium; it will, according to the increasing force of the earth's gravity, flow continuously in the direction in which it is being continually drawn; *it will take the form of a current*. The earth having arrived at the part of its journey where the summer solstice occurs, the solar tidal mass of water, with its vertex where the sun happens to be most nearly vertical, will now begin to travel in the direction in which terrestrial gravity decreases—namely, towards the equator. By that process, however, a shallower part of the solar wave is being at every moment

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brought over the parts of the globe which lie to northward of the wave's vertex—that is to say, northward of that parallel, or that part of the ecliptical circle over which the sun is vertical. That is an effect at any circle of geographical latitude so situate, which takes place through a diminishing amount of solar gravity being exercised upon the water. But the pre-existing amount of terrestrial gravity there remains the same. The latter force is, therefore, the more free to exert itself in the direction in which its power increases; while to the south of the same latitude, where the greatest solar influence is advancing in that direction, some compensatory movement of the waters may so occur as to cause a subordinate or comparatively local counter-current to be set up. Upon the following autumnal equinox being reached, a recurrence of events should ensue similar to those which took place between the vernal equinox and the summer solstice.

With respect to the lunar tidal water, or wave, a like course of reasoning appears to be applicable. Its monthly journey round the earth is in a path which is approximately that of the solar tidal-wave—that is to say, in a circle or path which, as extended to the surrounding heavens, crosses the sun's apparent path at an angle of a little more than 5°. But as the measure of the lunar gravitating influence upon the waters is greater than that of the sun, so would it seem necessary to infer that a greater effect in the form of ocean currents would ensue from it. The paths of the two waves, however, would seem to be sufficiently divergent from each other to produce, in combination with the earth's diurnal rotation upon its axis, very considerable variations and modifications in the resulting current-effects whether in regard to direction, volume, or velocity. It seems, further, difficult if not impossible to conjecture how far and in what manner the centrifugal force which the earth's diurnal rotation and its motion in orbit are supposed to bring into operation, may be an element in the production and maintenance of such currents; and, lastly, the mode in which they are intercepted or deflected by the land at various parts of their course is a matter which enhances in a very considerable degree the seemingly inextricable complication of the subject as a whole.

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But although ocean currents are subject to the same intricate and ever-varying combination of circumstances to which the tidal operations themselves are liable, yet an analysis and a generalisation of the data furnished by what may be deemed to be authoritative astronomical exposition concerning the tides, would seem to lead to the inevitable conclusion that those currents are a primary and direct effect of the gravitating power or force which the sun, the moon, and the earth respectively exercise upon the upper strata or upper portions of the ocean waters.

In what way, apart from the scientific interest of the subject, does such an analysis bear upon practical navigation? It shows, or is intended to show that ocean currents are a concomitant of tidal phenomena; that they result from the same originating causes; that being a product of those subtle and every-varying influences whence the tides are evolved, their direction and velocity, and probably their volume, are necessarily ever undergoing alteration, and hence that it is impossible for the navigator to be too cautious in making allowance for their complicated and erratic vagaries.

R. G. M. BROWNE.

MISSING EAST INDIAMEN.

A GOOD many of our East Indian ships have recently been making unusually long voyages, both outward and homeward, and although the greater part of them have at last put in an appearance either at this or the other end of the world, there are yet far too many—considering their high class—which the most sanguine of hopers and calculators can hardly expect to hear of again, unless on the long and dreary list of missing. During the last year some twelve or fifteen large first-class sailing-ships have either been wrecked or are missing in the Pacific, and the fate of some of them is now being slowly recorded by the appearance of their crews, picked up in storm-driven boats. But this paper does not propose to deal with vessels lost or missing amongst the coral reefs of the Pacific Ocean

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so much as to attempt an investigation—which will be very brief —into the causes affecting the disappearance of vessels on such well-known deep-water tracks as the homeward route by the Cape of Good Hope.

Notably, two large homeward-bound East Indiamen, recently posted as missing on this route, are the *Bolan* and the *Glanpadarn*, which, considering the number of days they have been at sea, have obviously not been placed on the list of forlorn hopes without very solid reasons. The fact of these being first-class ships invests their fate with no little interest in the minds of shipowners and underwriters. The *Bolan*, an iron ship of some 1,600 tons, belonging to owners in Liverpool, with a very high reputation in the East Indies and in England, and who have been engaged in the trade round the Cape for something more than half a century, left Calcutta on 27th of April, and was last heard of 69 days after that date at a point off the coast of Natal, exactly on the direct course between her ports. It is clear she had made an unusually long passage to this point, which has been explained by her bottom being foul and that she was generally a dull sailer, therefore the 7,000 miles which she still had to make before reaching London might readily have accounted for another 69 days, which would bring the date when she should have arrived up to September 17th. As three months have now passed, and the *Bolan* has not even been heard of at St. Helena, there can hardly be any doubt that the vessel is gone beyond all hopes. The same may be said of the *Glanpadarn*, which left Rangoon ten days before the *Bolan* left Calcutta, and has never since been heard of, and which it is highly probable was, from the longitude of the Mauritius homeward, in very near company to the *Bolan*, and lost either in the same gale or by the same circumstances, whatever they were. East India homeward-bound ships have frequently been wrecked on the coast of Natal. The rocky shores about East London, or indeed anywhere between Algoa Bay and Port Natal, have been responsible for the loss of many and many a good ship, from the time of the early Portuguese or Dutch navigators down to the present day, but there is no evidence to connect the fate of the two above vessels with

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anything like shipwreck on that inhospitable coast. It is, however, so sparsely populated that the bones of a hundred big ships might easily lay for years without discovery over a length of sea shore not even inhabited or ever visited by the most ignorant Kaffirs for long stretches of a hundred miles, where there are neither towns, villages, hamlets, fishermen, or inhabitants of any kind, save seals and sea birds; therefore it is quite possible for a ship to be cast away on such a coast, and herself and her crew to be dashed to atoms by the fearful breakers which are thrown up in a heavy gale, not only on the coast of Kaffraria, but anywhere between the long distance which separates Table Bay from Port Natal. The distance between those points is not less than 1,000 miles, upon any part of which homeward-bound East Indiamen are liable to shipwreck. When the *Bolan* was spoken, July 5th, she was not more than 120 miles from the land and, as already said, in the usual track of vessels, probably hoping to derive some assistance from the strong and fair currents which sweep down from the Mozambique Channel into the South Atlantic and round the great promontory of the Cape. The dangers of a rock-bound range of coast have been calculated on, but there are others of the sea which should be taken into account, and particularly during the month of July, when the north-west gales of the South Atlantic winter blow with great fury, and throw up a sea as heavy and as dangerous as—if not worse than—any which rage in the Western Ocean or break on the shores of these islands.

We have already had indications that the storms of this region have been severe, if not by recorded *missing* outward bounders, at least by a great number of dismasted ships and derelicts of one kind and another which have lately been turning up near the Cape. Let us hear what Captain Horsburgh had to say about the winds and weather near the "Bank of Agulhas" during July. "All ships from India," said that old and sagacious navigator, "which on their passage to Europe reach the Cape land anywhere between April and September should be in good condition, and well prepared to resist bad weather; for they will be liable to encounter storms from W.N.W. to W.S.W., which may continue for three whole

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days, and which blow with unusual fury. Many ships not being in good condition have sprung serious leaks, and been compelled to bear away for St. Augustine's Bay, in Madagascar, and several of the East India Company's ships have perished in the storms, with all hands. Some have escaped and have anchored in the bays to the eastward of the Cape, in great distress; others have reached Simon's Bay with much difficulty, where they have repaired their damages and refreshed their crews worn out with fatigue." What was true of the year 1801 is equally true now, although our iron ships do not strain to the extent of the grand old wooden castles which Horsburgh wrote of. Among the total losses referred to by Captain Horsburgh was probably the *Princess of Wales*, lost with the whole of her crew and passengers, numbering upwards of 700 souls. She was one of a fleet in which were also lost off the Cape in the winter season the *Ganges*, the *Skelton Castle*, the *William Pitt*, the *United Kingdom*, and four others. On another occasion, but still in July or August, other vessels of our wooden fleets had cause to remember the weather off the Cape. The *Britannia* and the *Bombay Castle* were struck by lightning during a westerly gale near Algoa Bay. Each ship had her foremast set on fire by the lightning, which penetrated "from the head to the centre," and bursting out there could not be got under. To save the vessels, which carried great quantities of saltpetre and other combustibles, the masts of both ships were cut away, and fortunately fell clear of them in a body of fire. This happened during a hurricane, in the pitch darkness of a winter's night, and was witnessed by the officers, seamen, and passengers of a fleet of eleven splendid ships all lying-to within a range of seven or ten miles. Another much later account of these winter storms off the Cape says:—"From the Cape bank to the meridian of the south end of Madagascar hard and dangerous gales happen in the winter season, accompanied with lightning, thunder and tremendous rain and hail storms which frequently prove very dangerous to the finest ships, particularly if they get too near the land." On another occasion, as may be read in the records of the East India Company, a homeward bound fleet in 35° S. and 25° E. fell in with strong gales from the westward, during which three vessels foundered

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and four managed to crawl into Simon's Bay pretty well shaken to pieces.

The *Calcutta* suffered the most. She was struck by lightning, and her masts in coming down in a tremendous crash knocked in her decks and tore away her bulwarks and waterways. At two in the morning, during the height of "a fearful storm," seven fire balls were seen to strike the ship with a tremendous explosion, while the crew were sending down top-gallant masts. Five men were thrown from the main topmast head into the sea, several fell on deck and were killed, while no less than 20 were badly scorched. One was killed in the fore-top while assisting others to extinguish the flames which had broken out in the fore-topsail, then lying flapping about waiting to be reefed. Happily such disasters from lightning are in these days less common, but the gales off the Cape still continue to throw up tremendous seas, which, running against the west flowing currents, test the masts, the decks, the iron hulls, and even the very existence of the finest and stoutest of our modern ships. Their weak point is the broad and low deck with large hatches, if it be anywhere. Some six years ago, in the winter season, the ship *Carnatic*, homeward bound from China, foundered in one of these storms. The cargo shifted and broke away her pumps; the hull was good and tight, but her bulwarks being torn away let in great quantities of water through the covering board. Other vessels went down in the same storm. Had they sailed in fleets as in the days of the great Company it is possible the records of shipwrecks—always gloomy—would still be much more interesting and instructive reading than it has now become under the barren heading of *missing*. It is certain, however, that as long as there are ships there will be occasional disasters of some kind, though at the present period they are far less numerous and less fearful than when grand old seamen like Horsburgh collected and laid down for the benefit of future generations nearly all the knowledge which at present guides maritime adventure in Eastern seas.

E. B.

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SHIPBUILDING IN 1889.

NEVER before in the annals of shipbuilding has this industry been so active as in the past year—and while this is a genuine cause of congratulation to both employers and employed in shipbuilding, marine engineering and allied industries, it is, however, to be greatly feared that the supply of tonnage has fully equalled the demand, despite the increase of the latter, due to the great expansion of the world's requirements, fostered by times of peace and comparative plenty. No longer is it necessary to look back with longing eyes to the triennial period of 1881-3, when the shipbuilding output was respectively one million, one and a-fifth million, and one and a-quarter million tons—all these results have been eclipsed in 1889 by an output of nearly one and a-third million tons built in the United Kingdom, and including Continental shipbuilding, close on one and a-half million tons. Such a result should cause shipping investors to pause and think. In individual cases no doubt better profits have been realised in 1889 than in 1888; but has this been general? Certainly the Black Sea rates have never in the past year reached the top figures of 1888, and it was from this quarter the improvement in freights set in. With new vessels and no outlay for repairs and renewals of parts of machinery, &c., it is very easy to secure apparently first-class results; but what about the future? Is it always to be a year or two of feast, followed by years of famine. Experience is said to make fools wiser, but in the case of shipping investors, if this be so, there must always be an influx of capitalists new to the risks of shipping to take the place of those who have been bitten and are now shy.

No doubt there are many aspects to this question of over-building, and several of these have been frequently adverted to in these pages. Shipbuilders anxious to keep their works fully employed embark in speculative building, sometimes at their sole risk, and sometimes, as was recently revealed in the Law Courts,

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in curious combination with steamship managers. It is this speculative element which is the danger to shipbuilding as it is to all sound trading—and it should be severely checked by bankers and all who have the power, now, before it is too late. Possibly, however, the crucial moment has passed away, as there is actually more *mercantile* tonnage at present under construction than there was a year ago. In addition, the cost of working vessels has increased, especially in the items of wages and bunker coals; in the latter item by nearly cent. per cent. Freights must, therefore, rise to maintain remunerative returns to the shipping investors.

One of the features of the year's output, which may well be mentioned before giving detailed particulars, is the large amount of new tonnage which has been acquired during 1889 by foreign and colonial shipowners. About one-third of the total output, or, roughly, 450,000 tons have been added to their fleets, so that while shipbuilders have not so much occasion to fear foreign competition, it would appear shipowners have. There is no doubt that our mercantile marine is heavily handicapped by load-line and deck cargo restrictions unknown to foreign-owned vessels, as well as to greater, nay, prohibitive expenses for reclassing old vessels, which are, therefore, partially or entirely sold to Norwegians and others. Even though a British steamer has traded six years satisfactorily with a given freeboard, sometimes the vessel is detained without previous notice, after bills of lading have been forwarded, and compelled to lighten; and as cargo cannot be touched, one steamer recently had to reduce her bunker coal by about 160 tons. This vessel was not loaded deeper than usual, not over her Plimsoll mark. To remedy this unfairness, all such regulations should be international, and every effort to this end should be made by all who are interested in the safety of seamen, including Mr. Plimsoll. Hereby, he would for once earn the gratitude of shipowners as well as seamen. Another factor in favour of Continental shipowners is the lower wages of their seamen, but *possibly* "trade unions" will ere long cause a levelling up. Table I. shows at a glance the comparative tonnages of 1888 and 1889, of practically all the shipbuilding ports and rivers in the United Kingdom, and the respective increases or decreases.

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TABLE I.

COMPARISON OF TONNAGE BUILT IN 1888 AND 1889.

	Tonnage built in 1888.	Tonnage built in 1889.	Increase.	Decrease.
The Clyde, including Paisley	269,960	321,469	51,509	—
The Tyne	213,205	281,710	68,505	—
Sunderland ...	142,410	217,336	74,926	—
Hartlepool	73,909	84,109	10,200	—
The Tees	57,171	110,429	53,258	—
Belfast	35,495	79,853	44,358	—
The Mersey ...	22,855	35,785	12,930	—
Whitby	13,267	13,146	—	121
Dundee	11,107	17,568	6,461	—
Southampton ...	10,051	169	—	9,882
Whitehaven ...	7,969	10,041	2,072	—
The Humber ...	7,474	21,528	14,054	—
Blyth	6,851	10,972	4,121	—
Leith	6,847	17,776	10,929	—
Aberdeen	6,573	9,470	2,897	—
Londonderry ...	4,813	7,268	2,455	—
Grangemouth and Alloa	4,556	14,047	9,491	—
Workington ...	3,882	4,703	821	—
Troon	2,870	3,771	901	—
Ayr	1,806	4,558	2,752	—
Chepstow	1,601	2,287	686	—
Kirkcaldy	1,571	1,571	—	—
Campbeltown ...	1,508	4,484	2,976	—
The Thames ...	1,152	5,356	4,204	—
Barrow-in-Furness...	620	26,847	26,227	—
Ardrossan	511	38	—	473
Rye...	300	302	2	—
Grimsby	260	184	—	76
Bristol	240	1,810	1,570	—
Gloucester	239	35	—	204
Falmouth	190	245	55	—

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	Tonnage built in 1888.	Tonnage built in 1889.	Increase.	Decrease.
Cowes, Isle of Wight	167	198	31	—
Wyvenhoe	167	181	14	—
Irvine	165	326	161	—
Yarmouth	152	154	2	—
Preston	126	250	124	—
Garmouth-on-Spey	119	—	—	119
Ipswich	88	79	—	9
Cardiff	52	2,750	2,698	—
Falkirk	—	80	80	—
Peterhead	—	64	64	—
Hayle	—	2,300	2,300	—
Milford Haven ...	—	1,402	1,402	—
Gosport	—	155	155	—
Plymouth	—	154	154	—
Portsmouth... ...	—	73	73	—
	912,299	1,317,033	415,618	10,884
			10,884	
Net Increase			404,734	

The Clyde, the Tyne, and the Wear continue to be the foremost trio of the shipbuilding rivers, and the Tees having nearly doubled its output takes the fourth place. The greatest increase for the year was attained by the port of Sunderland, the River Tyne standing second in this respect, the River Tees third, and the River Clyde fourth. It will be seen that increased outputs is the order of the day at all the leading centres, but Southampton has fallen into the back-ground—with the cessation of operations at the largest shipbuilding and engineering works of that port. On the other hand, Barrow-in Furness which, according to the statistics of 1888, threatened to disappear from our records, has had a considerable revival, due to the formation of the Naval Construction and Armaments Company, Limited. The output of Belfast is also noteworthy, it being more than double that of the previous year. It will also be noticed that seven minor ports have been more or less engaged in shipbuilding, which were not in the year 1888, and

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Hayle and Milford Haven are specially noticeable. It will be interesting to see if iron and steel shipbuilding continues to be long an industry of these ports.

The largest output of an individual firm or company during the year 1889 was that of Palmer's Shipbuilding and Iron Company, Limited, viz., twenty-eight steamers of 64,669 tons, all of which were constructed of steel, and for mercantile purposes, excepting the steel torpedo catcher *Planet*, built for the Austrian Government. Messrs. William Gray & Co., Limited, of Hartlepool, who held the premier position in 1888, take the second place with 58,731 tons, and Messrs. Harland & Wolff, of Belfast, the third, with 56,430 tons, more than one third of the latter tonnage being represented by the New White Star Liners, *Majestic* and *Teutonic*.

On the Thames, although relatively the increase of 4,204 tons is considerable, it does not fully represent the increased activity, as, *e.g.*, Messrs. Samuda Bros. have been engaged on a large armour-clad for the British Government, which gives employment to a large number of workmen, and will continue to do so during the current year. A new feature on the Thames is the construction of electrically-propelled launches, and these do not swell the statistics, not being measured for tonnage. Similarly, the output of Messrs. Yarrow & Co., of Poplar, is not included, who during the year 1889 constructed twenty torpedo boats, chiefly for the British Admiralty, with a speed varying from 22½ to 23 knots per hour. This firm is at present engaged in building sixteen craft of the same type for the Government of the Argentine Republic. Their speciality—Zephyr launches—has also continued in great demand, not only for local pleasuring purposes, but also otherwise, *e.g.*, two having been supplied for the Japanese armed cruisers building on the Clyde. Messrs. Yarrow & Co. also constructed a number of shallow draught steamers, principally stern-wheelers, for the Portuguese Government, for river traffic in East Africa.

In Table II., distinguishing sailing-vessels from steam-vessels, will be found carefully revised returns of the number of vessels and their tonnage, built at the respective rivers and ports during the past year.

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TABLE II.

SHIPBUILDING IN 1889.

River or Port.	Sailing Vessels. No.	Sailing Vessels. Tonnage.	Steam Vessels. No.	Steam Vessels. Tonnage.	Total Vessels. No.	Total Vessels. Tonnage.
The Clyde, including Paisley	75	80,946	157	240,523	232	321,469
The Tyne	4	505	149	281,205	153	281,710
Sunderland ...	4	4,630	98	212,706	102	217,336
The Tees	2	4,810	51	105,619	53	110,429
West Hartlepool ...	—	—	40	84,109	40	84,109
Belfast	3	1,674	24	78,179	27	79,853
The Mersey ...	14	14,097	28	21,688	42	35,785
Barrow-in-Furness	—	—	11	26,847	11	26,847
The Humber ...	—	—	38	21,528	38	21,528
Leith	1	60	17	17,716	18	17,776
Dundee	2	1,508	11	16,060	13	17,568
Grangemouth and Alloa ...	2	1,979	12	12,068	14	14,047
Whitby	—	—	7	13,146	7	13,146
Blyth	—	—	10	10,972	10	10,972
Whitehaven ...	3	8,297	2	1,744	5	10,041
Aberdeen	1	1,373	11	8,097	12	9,470
Londonderry ...	4	5,700	1	1,568	5	7,268
The Thames ...	13	1,015	46	4,341	59	5,356
Workington ...	2	4,403	1	300	3	4,703
Ayr	—	—	5	4,558	5	4,558
Campbeltown ...	—	—	3	4,484	3	4,484
Troon	—	—	7	3,771	7	3,771
Cardiff	—	—	1	2,750	1	2,750
Hayle	—	—	3	2,300	3	2,300
Chepstow	12	1,800	1	487	13	2,287
Bristol	2	1,400	1	410	3	1,810
Kirkcaldy	2	72	6	1,499	8	1,571
Milford Haven ...	—	—	2	1,402	2	1,402
Irvine	—	—	3	326	3	326
Rye	4	302	—	—	4	302

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River or Port.	Sailing Vessels. No.	Sailing Vessels. Tonnage.	Steam Vessels. No.	Steam Vessels. Tonnage.	Total Vessels. No.	Total Vessels. Tonnage.
Preston	—	—	2	250	2	250
Falmouth	—	—	3	245	3	245
Cowes	2	39	3	159	5	198
Grimsby	3	184	—	—	3	184
Wyvenhoe... ...	3	130	4	51	7	181
Southampton ...	2	169	—	—	2	169
Gosport	1	14	1	141	2	155
Plymouth	1	154	—	—	1	154
Yarmouth	1	154	—	—	1	154
Falkirk	—	—	1	80	1	80
Ipswich	1	79	—	—	1	79
Portsmouth ...	—	—	5	73	5	73
Peterhead	—	—	1	64	1	64
Ardrossan	—	—	2	38	2	38
Gloucester... ...	—	—	2	35	2	35
Total 1889 ...	164	135,494	770	1,181,539	934	1,317,033

From our first table, it will be seen the aggregate increase of tonnage built in the United Kingdom during 1889, as compared with the previous year, was 404,734 tons. The greater proportion of this amount was contributed by steam-vessels, viz., 357,783 tons, the corresponding figures for sailing-vessels being 46,951 tons. As the latter type of vessel has been steadily declining, owing to the excess of losses over new tonnage built, the latter increase is here noteworthy, more especially as the ratio of increase on the basis of the returns of the year 1888 is considerably in excess of that of steam-vessels. There are, and will for years continue to be, some trades especially suitable for sailing-vessels, notably to and from San Francisco and neighbouring ports. Steam-vessels have not been able to displace sailing-vessels entirely in the coasting trade, but it is not apparent that much, if any, tonnage has been built for this purpose. Foreign vessels have unfortunately absorbed the greater portion of the "short voyage" trade peculiarly suitable to sailing-vessels.

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A number of four-masted ships have been built during 1889. Messrs. Russell & Co., of Port Glasgow and Greenock, having launched eight, the largest of which was the *Dunkerque*, 3,152 tons, owned by Messrs. A. D. Bordes et Cie., Paris. Two firms on the Mersey constructed sailing-vessels exclusively, viz., Messrs. W. H. Potter & Son, and Messrs. R. and J. Evans & Co.; three of the six vessels built by the former were of the small type, registering 274 tons. But this is an exceptional instance; in most instances actual sea-going sailing-vessels built during the year being above 1,100 tons register.

The building of larger steam-vessels has continued, the average gross registered tonnage for the 770 steam-vessels of 1,181,539 tons built last year being 1,534 tons, as against 1,396 tons in the year 1888; 1,154 tons in 1887; 1,032 tons in 1886; and 685 tons in 1885. Doubtless the relative cost of working larger dead-weight carrying steamers is less than that of handy-sized vessels; but have not the latter a greater certainty of remunerative employment? Comparatively few of this class are now built, and many that are constructed are to foreign orders. The building of larger steamers has not been confined to any single shipbuilding centre—nor is the increased average accounted for by the construction of many abnormally large vessels. On the River Clyde the average tonnage of steamers built during the year 1889 rose to 1,532 tons, an increase of 146 tons over the average of the previous year (1,386 tons), which also was in excess of the immediately preceding years — in 1887 the average-sized steamer built being 1,257 tons, in 1886 only 977 tons, and in 1885 as low as 636 tons. Only six vessels built on the Clyde exceeded 5,000 tons gross register, and only one of these was upwards of 6,000 tons, viz., the s.s. *Friesland*, of 7,116 tons. On the River Tyne, where the largest vessel constructed was the Russian volunteer steamer *Orel*, of 4,500 tons, there was the same tendency visible—the average tonnage of steam-vessels being 1,888 tons, an increase of 123 tons over that of the year 1888 which was 1,765 tons. The corresponding figures for the previous years being 1,419 tons in 1887, 1,276 tons in 1886, and 1,146 tons in 1885, showing a steady increase during the last five years. At Sunderland, the increase is

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even greater, although only in one instance, that of the British-India steamer *Mombassa* did the gross register exceed 4,000 tons, while on the River Tyne three vessels were built in excess of the last-mentioned figures. During last year, on the Wear, the average tonnage was 2,170 tons as against 1,898 in the year 1888, or an increase of 272 tons. In 1887 the average sized steamer built was 1,815 tons, in 1886 only 1,463 tons, and in 1885 it was 1,335 tons. Evidently a larger class of vessel is being built at Sunderland. At Hartlepool, we have, however, to record again a decrease in the average size of the steamers built, it only reaching 2,102 tons, or 282 tons less than in the previous year, which showed a decrease on the corresponding figures of 1887, 2,437 tons. In the year 1886 the average of steamers built at Hartlepool was only 1,699 tons. The River Tees shows a similar decrease, the average for the past year being 2,071 tons, or 39 tons less than in 1888, when the average 2,110 tons was considerably in excess of the previous year, 1887. Belfast, owing to the building of the two large White Star Liners, has the highest figures of this class—the average size of steamers built there during the year being 3,257 tons.

It will be found from Table III. that mild steel continues in favour as the material for shipbuilding, but there are not lacking signs that it has not succeeded in making itself a universal favourite. The comparison in Table III. shows the tonnage of vessels built of steel during 1889, as compared with the aggregate tonnage built of steel, iron, composite, and wood, in all the ports enumerated.

TABLE III.

	Total Tonnage built in 1889.	Steel Tonnage built in 1889.	Percentage of Steel to Total Tonnage.
The Clyde including Paisley	321,469	311,308	96·83
The Tyne	281,710	276,601	98·18
Sunderland	217,386	209,294	96·29
The Tees	110,429	82,687	74·83
West Hartlepool	84,109	84,109	100·00

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	Total Tonnage built in 1889.	Steel Tonnage built in 1889.	Percentage of Steel to Total Tonnage.
Belfast	79,853	79,472	99·52
The Mersey	35,785	26,056	72·81
Barrow-in-Furness ...	26,847	26,847	100·00
The Humber	21,528	10,231	47·52
Leith	17,776	17,634	99·21
Dundee	17,568	15,089	85·60
Grangemouth and Alloa ...	14,047	14,047	100·00
Whitby	13,146	13,146	100·00
Blyth	10,972	7,963	72·57
Whitehaven	10,041	8,297	82·63
Aberdeen...	9,470	9,078	90·58
Londonderry	7,268	7,268	100·00
The Thames	5,356	1,945	36·31
Workington	4,703	4,703	100·00
Ayr	4,558	4,558	100·00
Campbeltown	4,484	3,617	80·66
Troon	3,771	3,771	100·00
Cardiff	2,750	2,750	100·00
Hayle	2,300	2,146	93·30
Chepstow	2,287	487	21·29
Bristol	1,810	1,810	100·00
Kirkcaldy	1,571	1,450	92·29
Milford Haven	1,402	1,250	89·15
Irvine	326	326	100·00
Rye	302	—	—
Preston	250	250	100·00
Falmouth...	245	245	100·00
Cowes	198	75	37·87
Grimsby	184	—	—
Wyvenhoe	181	50	27·62
Southampton	169	169	100·00
Gosport	155	—	—
Plymouth	154	—	—
Yarmouth	154	—	—
Falkirk	80	—	—

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	Total Tonnage built in 1889.	Steel Tonnage built in 1889.	Percentage of Steel to Total Tonnage.
Ipswich	79 ...	— ...	—
Portsmouth	73 ...	55 ...	75·34
Peterhead	64 ...	— ...	—
Ardrossan	38 ...	20 ...	52·63
Gloucester	35 ...	35 ...	100·00
Total	1,317,033 ...	1,288,739	Avge. 93·29

It is true that as in the year 1888, 92·26 per cent of the entire tonnage built during that year was constructed of steel, the margin for increase was not great, and steel manufacturers will probably be satisfied that it has reached 93·29 per cent. It has been alleged that in several instances vessels have been constructed of iron on account of the uncertainty and delay in delivering mild steel; but if this be true, we are persuaded the cases are exceptional. Iron has been preferred to steel on its merits. The gain of reduced weight in vessels of ordinary size is not now so great as it was, although, doubtless, the nearer approximation of the cost of both materials is in favour of steel. For small ordinary mercantile craft, steel has, however, practically no advantages, and this is apparently fully realised in some quarters, two firms on the Humber building 21 steamers of about 150 tons each entirely of iron. Again, a firm on the Tees which has had experience with steel, built during the past year, their entire output of 10,460 tons solely of iron, which included the oil-in-bulk steamer *Petrolea*, of 2,330 tons. In fourteen ports, but in ten of which the output was less than 10,000 tons, and in four less than 1,000 tons, steel was used exclusively. In 1887, there were only three ports where over 1,000 tons of shipping was constructed, in which the more modern material excluded iron from use; in 1888 the number increased to eight, and now in 1889, to ten; but despite this, as already shown, the aggregate average only rose about 1 per cent. Hartlepool again heads the list; Barrow-in-Furness stands second, displacing Whitby, which stands below Grangemouth and Alloa,

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whose outputs it may be remarked are combined, as at both ports, the shipbuilding yards are worked by the Grangemouth Dockyard Company. Taking the four rivers with the largest output of shipping, it will be seen the Tyne occupies the first position for the relative use of steel, with 98·18 per cent., as against 94·61 per cent. in the year 1888. The Clyde occupies the second place, with 96·83 per cent., as compared with 91·09 per cent. in the previous year. Sunderland, which stood before the Tyne and the Clyde in 1888, has relapsed from 99·3 per cent. to 96·29 per cent., and the River Tees has done similarly, the percentage for 1889 being 74·83 as against 76·71 per cent. in the year 1888.

As it may be of interest to some of our readers to note the rapid adoption of steel, and as the Clyde was foremost in this respect, we give the required figures from 1879 in Table IV.

TABLE IV.

SHIPBUILDING ON THE CLYDE.

Year.	Total Tonnage.	Tonnage built of Steel.	Percentage of Steel to Total Tonnage.
1879	174,750 ...	18,000 ...	About 10¼
1880	241,114 ...	42,000 ...	,, 17½
1881	341,022 ...	66,000 ...	,, 19⅓
1882	391,934 ...	108,254 ...	,, 27⅔
1883	419,664 ...	129,651 ...	,, 31
1884	296,854 ...	133,670 ...	,, 45
1885	193,729 ...	92,677 ...	,, 48
1886	172,636 ...	117,024 ...	,, 68
1887	184,830 ...	148,409 ...	,, 80¼
1888	269,960 ...	245,919 ...	,, 91
1889	321,469 ...	311,308 ...	,, 96⅞

Allusion has already been made to the White Star Liners *Majestic* and *Teutonic*, the latter of which commenced her sailings during the year. It is yet to be seen if either of these vessels will eclipse the fast passages of the Inman and International Line steamers; but the fact that the *Teutonic* made the fastest maiden passage is at least promising. Another notable twin-screw steamer

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launched during the year is the *Columbia*, built for the Hamburg-American Steam Packet Company by Messrs. Laird Bros., Birkenhead, and whose passages have been amongst the shortest across the Atlantic.

During the year a number of vessels have been fitted with quadruple-expansion engines, but as elsewhere in this number of the *Nautical Magazine* a complete record is given of this class of work, a mere mention of the fact will here suffice. Forced draught has also been adopted in a number of mercantile vessels, notably in the case of vessels engined and boilered by the Wallsend Slipway and Engineering Company, Limited, Wallsend, and by Messrs. W. Gray and Co., Limited, Hartlepool. In the steamer *Santon*, fitted by the first-mentioned firm, a pressure in the ashpits of 0·2 in. to 0·5 in. according to the condition of the fires, gave the most economical results.

Continental shipbuilding has shared considerably in the increased activity, as will be seen from Table V., in which we give a comparison of the results of 1889 and 1888.

TABLE V.

COMPARISON OF CONTINENTAL SHIPBUILDING OF 1889 AND 1888.

	1889.		1888.	
	No. of Vessels.	Tonnage of Vessels.	No. of Vessels.	Tonnage of Vessels.
Austria ...	13	... 6,173	6	... 686
Belgium ...	7	... 2,250	32	... 3,261
Denmark ...	13	... 13,052	4	... 5,483
France ...	13	... 30,922	7	... 24,237
Germany ...	108	... 93,243	68	... 34,592
Netherlands ...	14	... 10,823	6	... 3,085
Italy ...	4	... 159	—	... —
Russia (Finland only) ...	20	... 561	17	... 735
Norway and Sweden ...	11	... 7,619	2	... 2,522
	203	164,802	142	74,551

Net increase, 61 vessels of 90,251 tons.

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It will be noticed that Germany stands far ahead of the other nations, and has largely increased its output; the Netherlands, Denmark and France coming next respectively, as to increased activity, although the latter is second for the amount of tonnage constructed. Germany and France are both rivals not to be altogether despised, as orders for the Japanese, Spanish and other Governments somehow are secured by their shipbuilding establishments, despite our boasted pre-eminence as the shipbuilding nation of the world.

OFFICIAL RETURN OF BRITISH WRECKS IN DECEMBER, 1889.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of December, 1889, and the number of lives lost, are as follows:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	43	14,111	131
Steam	9	5,998	20
Total	52	20,109	151

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in December relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—THOMAS GRAY, Assistant-Secretary, Marine Department.—Board of Trade, 1st January, 1890.

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TIDE TABLES FOR FEBRUARY, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	LONDON BRIDGE.		HULL.		NORTH SHIELDS.		LEITH.		DEVONPORT.		DOVER.		WESTON-SUPER-MARE.		LIVERPOOL.		GREENOCK.		QUEENSTOWN.		KINGSTOWN.		LONDONDERRY.		BREST.	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
S	1	11 41	—	8 53	4 26	0 58	1 28	—	0 22	2 40	3 18	8 37	9 6	4 8	4 36	9 1	9 28	9 34	10 4	2 24	2 56	8 47	9 16	5 47	6 10	1 22	1 51
S	2	0 13	0 42	4 54	5 17	1 54	2 16	0 49	1 11	3 45	4 13	9 31	9 54	5 6	5 33	9 51	10 12	10 29	10 52	3 28	3 46	9 42	10 6	6 31	6 52	2 15	2 37
M	3	1 7	1 29	5 38	5 58	2 37	2 56	1 32	1 52	4 38	5 0	10 16	10 37	5 57	6 19	10 31	10 50	11 13	11 34	4 7	4 28	10 26	10 43	7 12	7 32	2 57	3 16
Tu	4	1 50	2 10	6 17	6 36	3 14	3 31	2 11	2 29	5 21	5 41	10 57	11 17	6 40	7 0	11 9	11 27	11 55	—	4 48	5 6	11 0	11 16	7 51	8 9	3 34	3 51
W	5	2 27	2 48	6 54	7 12	3 48	4 4	2 46	3 2	5 59	6 16	11 36	11 54	7 18	7 35	11 44	—	0 14	0 32	5 24	5 41	11 32	11 48	8 26	8 42	4 8	4 25
Th	6	3 1	3 16	7 29	7 46	4 20	4 36	3 17	3 33	6 33	6 50	—	0 12	7 51	8 7	0 1	0 18	0 49	1 6	5 58	6 15	—	0 5	8 56	9 10	4 41	4 57
F	7	3 31	3 47	8 2	8 18	4 53	5 10	3 49	4 5	7 6	7 22	0 30	0 48	8 23	8 39	0 34	0 50	1 23	1 40	6 32	6 48	0 22	0 39	9 24	9 39	5 13	5 29
S	8	4 3	4 20	8 34	8 50	5 27	5 44	4 22	4 39	7 38	7 54	1 6	1 23	8 54	9 9	1 6	1 22	1 56	2 11	7 4	7 20	0 56	1 13	9 55	10 11	5 45	6 1
S	9	4 36	4 53	9 6	9 23	6 1	6 19	4 56	5 13	8 11	8 28	1 41	1 59	9 24	9 40	1 38	1 54	2 27	2 44	7 37	7 54	1 30	1 48	10 27	10 44	6 18	6 35
M	10	5 10	5 26	9 41	10 0	6 37	6 56	5 31	5 51	8 45	9 2	2 17	2 36	9 56	10 12	2 11	2 29	3 1	3 19	8 11	8 28	2 6	2 25	11 3	11 24	6 53	7 12
Tu	11	5 44	6 2	10 19	10 39	7 15	7 36	6 12	6 33	9 19	9 38	2 55	3 14	10 28	10 44	2 47	3 6	3 37	3 56	8 46	9 5	2 45	3 6	11 49	—	7 33	7 54
W	12	6 22	6 45	11 2	11 28	8 0	8 26	6 55	7 20	9 59	10 22	3 34	3 55	11 2	11 24	3 27	3 50	4 16	4 38	9 26	9 49	3 28	3 52	0 17	0 49	8 16	8 41
Th	13	7 8	7 36	11 58	—	8 55	9 29	7 50	8 23	10 50	11 21	4 19	4 45	11 52	—	4 16	4 47	5 8	5 32	10 16	10 48	4 20	4 53	1 25	2 4	9 11	9 45
F	14	8 5	8 39	0 32	1 8	10 8	10 48	9 0	9 41	11 55	—	5 14	5 48	0 24	1 1	5 24	6 6	6 5	6 42	11 27	—	5 28	6 5	2 45	3 24	10 24	11 9
S	15	9 18	10 2	1 45	2 24	11 28	—	10 22	11 3	0 32	1 14	6 26	7 8	1 44	2 28	6 52	7 37	7 24	8 7	0 9	0 53	6 44	7 24	4 2	4 38	11 55	—
S	16	10 46	11 30	3 8	3 42	0 8	0 47	11 41	—	1 57	2 39	7 51	8 31	3 13	3 57	8 18	8 54	8 49	9 29	1 37	2 19	8 3	8 41	5 10	5 40	0 37	1 16
M	17	—	0 9	4 20	4 54	1 22	1 53	0 16	0 47	3 20	3 58	9 6	9 37	4 39	5 16	9 26	9 55	10 4	10 35	2 56	3 29	9 17	9 49	6 8	6 35	1 51	2 20
Tu	18	0 43	1 11	5 22	5 48	2 21	2 46	1 15	1 42	4 30	4 59	10 6	10 34	5 47	6 16	10 20	10 45	11 3	11 30	3 57	4 24	10 15	10 38	7 2	7 28	2 46	3 11
W	19	1 39	2 6	6 14	6 39	3 10	3 33	2 7	2 31	5 27	5 54	11 1	11 27	6 43	7 9	11 10	11 35	11 57	—	4 50	5 15	11 1	11 24	7 53	8 16	3 35	3 59
Th	20	2 29	2 52	7 3	7 27	3 56	4 19	2 53	3 15	6 20	6 44	11 53	—	7 34	7 56	11 59	—	0 23	0 47	5 40	6 3	11 47	—	8 38	8 58	4 23	4 46
F	21	3 14	3 36	7 50	8 11	4 41	5 3	3 37	3 58	7 6	7 25	0 17	0 40	8 17	8 37	0 21	0 43	1 10	1 33	6 25	6 46	0 9	0 31	9 18	9 38	5 7	5 28
S	22	3 57	4 18	8 31	8 51	5 25	5 46	4 19	4 40	7 45	8 5	1 3	1 25	8 56	9 14	1 4	1 24	1 54	2 14	7 6	7 26	0 53	1 15	9 57	10 16	5 48	6 7
S	23	4 38	4 57	9 11	9 31	6 6	6 26	5 1	5 21	8 25	8 44	1 46	2 6	9 32	9 48	1 43	2 2	2 33	2 52	7 45	8 3	1 36	1 56	10 35	10 54	6 26	6 44
M	24	5 16	5 35	9 50	10 8	6 45	7 4	5 40	6 0	8 59	9 14	2 25	2 44	10 3	10 19	2 20	2 38	3 10	3 28	8 20	8 37	2 15	2 34	11 13	11 36	7 2	7 21
Tu	25	5 53	6 12	10 27	10 49	7 25	7 48	6 21	6 43	9 30	9 49	3 3	3 23	10 35	10 51	2 56	3 16	3 46	4 5	8 55	9 14	2 54	3 15	—	0 3	7 42	8 3
W	26	6 33	6 53	11 13	11 59	8 12	8 37	7 6	7 31	10 9	10 30	3 43	4 3	11 9	11 31	3 36	3 58	4 25	4 47	9 34	9 56	3 38	4 2	0 32	1 3	8 25	8 50
Th	27	7 16	7 43	—	0 9	9 6	9 40	8 0	8 33	10 54	11 21	4 25	4 51	11 59	—	4 25	4 57	5 11	5 40	10 24	10 59	4 30	5 2	1 38	2 17	9 19	9 55
F	28	8 12	8 47	0 42	1 18	10 19	11 0	9 10	9 57	11 53	—	5 22	5 58	0 34	1 15	5 36	6 20	6 15	6 55	11 40	—	5 38	6 17	2 56	3 35	10 38	11 23

TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* — *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant.	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−8 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 18	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+8 8	Brest
Boulogne	+0 18	Dover
Bridport	+0 24	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadiz	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 37	Dover
Campbellton	−0 23	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bar	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 37	Londonderry
Coquet Road	−0 23	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 5	Dover
Exmouth	+0 33	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 12	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 53	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 53	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 8	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 48	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 13	Devonport
Peterhead	−1 43	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 38	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 22	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 8	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 23	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+2 20	Queenstown
Whitby	+0 23	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 43	London
Youghall	+0 18	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt.= Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
49	England—Thames Entrance—Duke of Edinburgh Chan.	New lights and buoyage, particulars.
50	„ East Coast—Hartlepool Bay—Long Scar	Bell buoy altered in position.
51	Scotland—Aberdeen Harb.—North Pier	New fog-signal.
52	Ireland—Cork Harb.—Harbour Rock	Experimental light buoy.
53	Baltic Entrance—Kattegat—Anholt Is., N.W. Reef	Extension to N.W.
54	Baltic—Gulf of Bothnia—Agön	New fog-signal.
55	„ „ Hernö	New fog-signal.
56	France—N. Cst.—Calais	New harbour lights.
57	„ „ Boulogne Harb.	Change in buoyage.
58	„ W. Cst.—Belle Ile—Goulfar Bay	Permanent light established.
59	„ „ St. Gilles sur Vie—Croix de Vie	Lights altered.
60	„ „ Gironde River—Pointe de Grave	Experimental light buoy withdrawn.
61	Mediterranean—Algeria—Port Bona	Decreased depths near entrance.
62	„ „ „	Harbour light and works.
63	„ Italy—Naples Roads	Lights and buoys altered.
64	„ Ionian Sea—Greece—Cephalonia Is.—Guardiana Is.	Intended re-exhibition of light.
65	„ Ionian Sea—Santa Maura Is.—Cape Ducato	New light.
66	„ Adriatic—Fiume	Additional harbour light.
67	„ Egypt—Alexandria	Time and fire signals.
68	Africa—W. Coast—St. Ann Bay	Wreck on shoal.
69	„ Gulf of Guinea—Bonny River	Coal depôt discontinued.
70	North Atlantic—Gran Canaria—Puerto de la Luz	Lights marking wreck.
71	Africa—Zanzibar Is.—Mwana Mwana Is.	New light.
72	India—Gulf of Cutch—Mandvi	Permanent light exhibited.

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MONTHLY ABSTRACT OF NAUTICAL NOTICES—*Continued.*

No.	PLACE.	SUBJECT.
73	BAY OF BENGAL—Calcutta, &c., Burma	Storm signals.
74	CHINA SEA—Singapore—Salat Sinki—Ajax Shoal	Intended light-vessel.
75	EASTERN ARCHIPELAGO—Surabaya Strait	Buoys marking cable.
76	CHINA—Amoy Harb.—Kulangsen	Time signal.
77	AUSTRALIA—W. Coast—Shark Bay—Gascoyne Road	Temporary light-vessel.
78	„ E. Coast—Smoky Cape	Intended new light.
79	„ „ Ulladulla Harb.—Warden Head	New light, &c.
80	„ „ Moreton Bay	Extension of east bank.
81	SOUTH PACIFIC—Fiji Is.—Alfred and Calinon Reefs	Non-existence of reefs.
82	NORTH AMERICA—W. Coast	Current floats adrift.
83	„ „ „ British Columbia—Mayne Is.—Edith Point	Sunken rock.
84	„ „ U.S. Pacific Cst.—Oregon—Cape Meares	New light.
85	„ „ „ California—San Diego Bay	Harbour lights.
86	SOUTH AMERICA—Magellan Strait—Queen Chan.—Walker Shoal	New buoy.
87	„ „ E. Coast—Venezuela—River Orinoco	Withdrawal of light-vessel at entrance; alterations in channel.
88	UNITED STATES	Additional storm-signal.
89	„ „ Maryland—Potomac River—Wicomico River	New light and fog-signal.
90	„ „ New York—East River Hallet Point	New fog-signal.
91	„ „ Maine—Frenchman Bay—Crabtree Ledge	New light.
92	GULF OF ST. LAWRENCE—Prince Edward Is.—Hillsborough Bay—Hazard Point	New leading lights.

NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

49.—ENGLAND.—*Thames Entrances.—Duke of Edinburgh Channel.—Tongue and Princes Channel Light-Vessels.—Buoyage Changes, &c., &c.*—In accordance with notices previously issued, the lighting of the Duke of Edinburgh channel has now been carried into effect. The following detailed particulars of the changes, &c., which have consequently been made in the marking of the Thames estuary are published for general information:—

(1.) The *Tongue Light-Vessel* has been moved about two miles to

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the eastward of her former position. She now lies in 6 fathoms L.W. spring tides, with the following bearings, viz. :—Edinbro' channel light-vessel, N.N.W. ¼ W. (distant $3\frac{8}{10}$ths miles); East Shingles buoy, N.W. Wly. (distant $2\frac{6}{10}$ths miles); Princes channel light-vessel, W. by N. ½ N. Nly. (distant $4\frac{7}{10}$ths miles); East Tongue buoy, W. (distant $2\frac{3}{10}$ths miles).

(2.) The *Princes Channel Light-Vessel* has been moved about two miles to the eastward of her former position. She now lies in 11½ fathoms L.W. spring tides, with the following marks and bearings, viz. :—Chislet mill, in line with the coastguard station, east of Reculvers, S.W. ¾ S. Sly.; St. Peter's Church tower, half its width open eastward of Margate New Church tower, S.S.E. Sly.; S.E. Girdler buoy, W. by N. ¼ N. (distant $2\frac{8}{10}$ths miles); N.E. Tongue buoy, S.S.E. ¼ E. (distant $\frac{9}{10}$ths of a mile); S.E. Shingles buoy, E. (distant $1\frac{3}{10}$ths mile).

(3.) The *East Tongue Buoy* is now surmounted with a staff and diamond.

(4.) The *Tongue Knoll* and *Shingles Spit Buoys* have been discontinued.

(5.) A *New Spherical Buoy*, painted in red and white horizontal bands, surmounted with a staff and diamond, and named "*East Girdler*," has been placed to mark the east end of the Girdler sand. It lies in 5½ fathoms L.W. spring tides, with the following marks and bearings, viz. :—The low West end of the Miller's house at Chislet, in line with a house on the beach, next East of George's farm, S.S.W.; Mount Pleasant house, in line with a large house on the cliff next West of Birchington West mill, S. ¼ E. Ely.; Girdler Spit buoy, N.W. by N. (distant $\frac{4}{10}$ths of a mile); Princes Channel light-vessel, E. by S. ¾ S. (distant $1\frac{3}{10}$ths mile); S.E. Girdler buoy, W. ¾ N. (distant $\frac{7}{10}$ths of a mile).

(6.) The *Girdler Spit Buoy* has been moved 2½ cables N.W. ¼ W. of its former position, and now lies in 35 feet L.W. spring tides, with the following marks and bearings, viz. :—Girdler Old beacon, midway between the Middle Ground beacon and Warden point, W. ¼ S. Sly.; Chislet mill, in line with the East end of George's farmhouse, S. by W. ¾ W.; N.E. Girdler buoy, N.W. ½ W. (distant $\frac{7}{10}$ths of a mile); S.W. Shingles buoy, E. by N. ½ N.

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(distant $\frac{5}{10}$ths of a mile); East Girdler buoy, S.E. by S. (distant $\frac{4}{10}$ths of a mile).

(7.) The *S.E. Girdler Buoy* is now a conical bell buoy painted black, and exhibits a *gas occulting light.*

(8.) The *East Shingles Buoy* has been moved 5 cables S.W. $\frac{1}{4}$ W. of its former position, and now lies in 39 feet L.W. spring tides, with the following bearings, viz.:—South Longsand buoy, N.E. by E. $\frac{1}{4}$ E. Ely. (distant $1\frac{1}{4}$ mile); East Tongue buoy, S. by W. $\frac{1}{4}$ W.Wly. (distant $1\frac{8}{10}$ths mile); Edinbro' channel light-vessel, N. $\frac{1}{4}$ E., (distant $1\frac{3}{4}$ mile); Tongue light-vessel, S.E. Ely. (distant $2\frac{5}{10}$ths mile); S.E. Shingles buoy, S.W. by W. $\frac{3}{4}$ W. (distant 1 mile).

(9.) The *Shingles Patch Buoy* (No. 1) will immediately be moved one cable N.W. $\frac{1}{2}$ N. of its present position, and will then lie in five fathoms L.W. spring tides, with the following compass bearings, viz.:—Tongue light-vessel, S.E. by S. (distant $3\frac{7}{10}$ths miles); Edinbro' channel light-vessel, N.E. $\frac{1}{4}$ E. (distant $\frac{6}{10}$ths of a mile); N.E. Shingles buoy, N.W. $\frac{1}{4}$ W. (distant 2 miles).

(10.) The *Shingles Patch Buoy* (No. 3), will immediately be moved $1\frac{1}{4}$ cable S. by E. $\frac{1}{4}$ E. of its present position, and will then lie in five fathoms L.W. spring tides, with the following bearings, viz.:—Shingles beacon, S.S.W. $\frac{3}{4}$ W. Sly. (distant $2\frac{5}{10}$ths mile); North Shingles beacon, W. by N. $\frac{1}{4}$ N. Nly. (distant $1\frac{8}{10}$ths mile); W. Mid Longsand buoy, N. by E. $\frac{1}{4}$ E. (distant $\frac{8}{10}$ths of a mile).

(11.) The *S.W. Longsand Buoy* has now been discontinued.

(12.) A *New Light-Vessel* has been placed on the eastern side of the Edinburgh channel in the position formerly occupied by the S.W. Longsand buoy, and will exhibit a quick flashing white light consisting *one flash every five seconds.* In thick or foggy weather a gong will be sounded. The vessel is painted red, with the words *Edinburgh Channel* in large white letters on her sides, and to distinguish her by day she carries a half globe, base uppermost, at her masthead. She lies in $6\frac{1}{4}$ fathoms L.W. spring tides, with the following marks and bearings, viz.:—The North Margate beacon, its apparent height west of Minster mill, S. by W. Wly.; Monkton beacon over the gap between the two western blocks of houses at Cliff End, S.S.W. Wly.; Black Deep light-vessel, N.W. by W. Wly. (distant $3\frac{5}{10}$ths miles); Tongue light-vessel,

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S.S.E. ¼ E. (distant $3\frac{8}{10}$ths miles); East Shingles buoy, S. ½ W. (distant $1\frac{7}{10}$ths mile); South Longsand buoy, S.E. by E. (distance $1\frac{6}{10}$ths mile).

(13.) The *N.E. Shingles* is now an *occulting gas-lighted* can buoy painted in black and white chequers. It has been moved 1¾ cable N.W. by W. ¼ W. of its former position, and now lies in 7 fathoms L.W. spring tides, with the following marks and bearings, viz.:—The Reculvers, twice their height east of Chislet mill, S.S.W. ¾ W.; the North Shingles beacon and New Girdler beacon in line, S.W. by W. ¼ W. Wly.; Black Deep light-vessel, N.W. Nly. (distant $1\frac{3}{10}$ths mile); W. Mid Longsand buoy, E. by N. (distant $1\frac{1}{10}$th mile); North Shingles buoy, W. ½ N. (distant 1 mile).

(14.) The *North Shingles Buoy* has been moved 2½ cables S.W. by W. ¼ W. of its former position, and now lies in 6 fathoms L.W. spring tides, with the following marks and bearings, viz.:—Margate New Church tower, twice its width westward of North Margate beacon, S. by E. ¼ E. Ely.; Margate Hook beacon, just open of the west end of St. Nicholas wood, S. by W. ¼ W. Wly.; Knock John buoy, W. by N. ¾ N. (distant $2\frac{1}{10}$th mile); Black Deep light-vessel, N. ¾ E. (distant $\frac{9}{10}$ths of a mile); N.E. Shingles buoy, E. ¼ S. (distant 1 mile).

(15.) The *West Mid Shingles Buoy* has been moved 4 cables W. ¼ S. of its former position, and now lies in 7½ fathoms L.W. spring tides, with the following mark and bearings, viz.:—Monkton beacon, in line with the New Girdler beacon, the Margate Hook beacon being nearly midway between the New and Old Girdler beacons, S. ½ E.; Knob buoy, W. ¾ N. Nly. (distant $2\frac{8}{10}$ths miles); East Knob buoy, N.W. (distant 1 mile); Knock John buoy, N.E. by N. (distant $1\frac{3}{10}$ths mile); East Girdler beacon, East, Sly. (distant $1\frac{1}{10}$th mile).

(16.) A *New Light-Vessel* has been placed about midway between the West Longsand and East Knock John buoys, and will exhibit a group flashing white light, consisting of *four short flashes in quick succession every thirty seconds*, the four flashes occupying about ten seconds, followed by a long eclipse of about twenty seconds. In thick or foggy weather a gong will be sounded. The

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vessel is painted red, with the words "*Black Deep*" in large white letters on her sides, and to distinguish her in the daytime she carries a square at her masthead. She lies in $6\frac{3}{4}$ fathoms L.W. spring tides, with the following marks and bearings, viz.:—Chislet Mill, in line with the west end of George's farm, S.S.W. Wly.; North Margate beacon, two-thirds from Margate new church towards the old church, S. by E. $\frac{1}{4}$ E.; East Knock John buoy, W. $\frac{1}{4}$ N. Nly. (distant $\frac{7}{10}$ths of a mile); West Longsand buoy, E. by N. (distant $\frac{7}{10}$ths of a mile); North Shingles buoy, S. $\frac{3}{4}$ W. (distant $\frac{9}{10}$ths of a mile).

(17.) The *Knock John* and *Knob* buoys are conical shape, painted black, and exhibit *gas occulting lights.*

Note.—Mariners are reminded that, as will be seen by the chart, the tides do not set fairly through the Black Deep and Duke of Edinburgh channels, but somewhat obliquely across the adjacent sands.

50.—ENGLAND.—*East Coast.—Hartlepool Bay.—Long Scar Bell Buoy.—Alteration in Position.*—It has been found necessary to move Long Scar bell buoy into deeper water. The buoy now lies 3 cables S.E. by E. of its former position, in about 5 fathoms at L.W. spring tides, with Seaton low lighthouse W. by S. (distant $1\frac{4}{10}$ mile); Hartlepool Heugh lighthouse N. by W. $\frac{3}{4}$ W. (distant $1\frac{3}{10}$ mile). *Variation*, 18° *W.*

51.—SCOTLAND.—*East Coast.—Aberdeen Harbour.—Fog-Signal on North Pier.*—A fog-signal has been established on the seaward end of the North pier, entrance to Aberdeen harbour. The signal is a bell, which, during thick or foggy weather, will be struck *three* times in succession, with an interval of *two seconds* between each stroke, followed by an interval of *ten seconds'* silence.

Note.—The steam fog-whistle near Girdleness lighthouse will be continued as heretofore.

52.—IRELAND.—*South Coast.—Cork Harbour.—Temporary Experimental Light-Buoy Eastward of Harbour Rock.*—On or about 21st January, 1890, a light buoy will be placed, on trial, about 180 feet S.S.W. of No. 1, or eastern Harbour rock-buoy, entrance to Cork harbour. It will be a *flashing* white gas light (Pintsch system). At the expiration of 10 weeks' trial, or sooner,

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in the event of the supply of gas being exhausted, this light-buoy will be withdrawn. Position, lat. 51° 47′ 40″ N., long. 8° 15′ 45″ W.

Note.—Mariners are cautioned not to depend on seeing this buoy, as owing to its exposed position the light may be extinguished, or the buoy may be washed away. *Variation*, 22° *W.*

53.—BALTIC ENTRANCE.—*Kattegat.—Danish Coast.—Anholt Island N.W. Reef.—Extension North-Westward.*—From a recent examination of the locality it appears that Anholt island N.W. reef extends farther north-westward than is shown on the charts. The two-fathoms limit on the N.W. end of the reef is now about 8 cables within the beacon buoy marking its extremity, the position of which is unaltered.

54.—BALTIC.—*Gulf of Bothnia.—Swedish Coast.—Fog-Signal at Agön Lighthouse.*—On the opening of navigation in 1890 a fog-signal will be established at Agön lighthouse. The signal will be a small horn, which, during thick or foggy weather, will give *every fifth minute* a prolonged note, having a duration of *about one minute*. This horn is intended to be heard only over the adjacent fairway. Position, lat. 61° 33′ N., long. 17° 29′ E.

55.—BALTIC.—*Gulf of Bothnia.—Swedish Coast.—Fog-Signal at Hernö Lighthouse.*—On the opening of navigation in 1890, a fog-signal will be established at Hernō lighthouse. The signal will be a small horn, which, during thick or foggy weather, will give *every fifth minute* two blasts in quick succession, each having a duration of *about fifteen seconds*. The horn is intended to be heard only over the adjacent fairway. Position, lat. 62° 36′ N., long. 18° 4′ E.

56.—FRANCE.—*North Coast.—Calais.—Harbour Lights in New Outer Port.*—A harbour light is now exhibited at the western extremity of the north quay of the new outer port, Calais. It is a *fixed green* light. *Also* a gas-lighted buoy now marks the western extremity of the south quay of the new outer port.

57.—FRANCE.—*North Coast.—Boulogne Harbour Approach.—Automatic Signal Buoy not to be Replaced off S.W. Mole, and Intended Automatic Signal Buoy off South Mole.*—With reference to notice in 1887, that an experimental buoy, fitted with an automatic whistle, would be placed south-westward of the angle of the

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S.W. mole, at Boulogne, by notice, dated 9th December, 1889, the buoy has been driven from its moorings and will not be replaced in position. Also, it is intended to place a buoy, fitted with an automatic whistle, off the extremity of the South pier at Boulogne.

58.—FRANCE.—*West Coast.—Belle Ile.—Goulfar Bay.—Re-Exhibition of Permanent Light, and Discontinuance of Provisional Light.*—With reference to notice in 1889, and previous notice, that Goulfar bay light, on the S.W. side of Belle ile, would be altered to an *electric* light, and that during the progress of the work, the permanent light would be discontinued and a provisional light exhibited; on 5th January, 1890, the permanent light would be re-exhibited, and the provisional light discontinued. The permanent light is an *electric group flashing* white light, showing *every ten seconds* a group of two flashes separated by an eclipse of nearly *two seconds'* duration, the intervals between the groups being about *seven seconds*. The light is elevated 276 feet above H.W., and visible from a distance of 23 miles. Position, lat. 47° 18¾′ N., long. 3° 13½′ W.

59.—FRANCE.—*West Coast.—St. Gilles sur Vie.—Croix de Vie. — Alterations in Lights.* — On 15th January, 1890, the following alterations will be made in the lights exhibited at Croix de Vie, St. Gilles sur Vie, west coast of France:—The front leading light will remain as heretofore (*fixed red*); the front of the lighthouse will be painted red. The rear leading light will be a *fixed* light, with *white, red,* and *green* sectors; it will show *red* between the bearings of N. 74° E. and N. 62° E., or from Grosse Terre point to the southern extreme of Pilours rocks; *green* between N. 18° E. and N. 7° W., or from the western extreme of Bonneau rock to the coast eastward; and *white* in all other directions seaward. Within a distance of about one mile from the coast northward of Grosse Terre point, the *white* light will be obscured by the land between the bearings of S. 50° E. and N. 74° E. This light will be elevated 88 feet above the sea. Illuminating apparatus, dioptric, or by lenses, and of the fifth order. The light exhibited from the Grand mole head (Réverbère) will be obscured seaward, and will not become visible

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from a vessel until she has entered the port. Position, lat. 46° 41¼′ N., long. 1° 56½′ W. *Variation*, 17° *W.*

60.—FRANCE.—*West Coast.—Gironde River Entrance.—Withdrawal of Experimental Light-Buoy Eastward of Pointe de Grave.*—With reference to notice in 1888, that an experimental light-buoy had been placed eastward of pointe de Grave, Gironde river entrance, on 30th November, 1889, the buoy (lat. 45° 34½′ N., long. 1° 2′ W.), from which was shown a *fixed* white light, would be withdrawn.

61.—MEDITERRANEAN.—*Algeria.—Gulf of Bona.—Port Bona.—Decreased Depths near Entrance.*—In the approaches to the entrance of port Bona are several spots on which the depth is not more than about 10 feet.

Note.—Vessels entering port Bona, therefore, should use caution, especially in heavy weather.

62.—MEDITERRANEAN.—*Algeria.—Gulf of Bona.—Port Bona.—Harbour Works and Light.*—With reference to notice on decreased depths near the entrance to port Bona, the following further information has been published concerning the harbour works and light at that port:—The entrance to the port, previously about 2¼ cables wide, has been reduced to a breadth of about 1¼ cable, by the extension (now in progress) of the South pier towards the outer extremity of the North pier. A fixed *white* light marks the northern extreme of this extension, but it being difficult to maintain a floating light in this position, the foundation of a structure has been commenced, from which it is shortly intended to exhibit the fixed *green* light now shown on the South pier. The channel leading to the basin has been dredged to a depth of 23 feet. The N.E. portion of the port, between this channel and the North pier, has also been dredged to a depth of 23 feet, as far as the quay now in course of construction at the head of the port, and which will join the inner part of the North pier to the North pier of the basin. It is also proposed to close the present entrance to the port by extending the South pier to the outer extremity of the North pier, and about 2¾ cables beyond; and to construct a curved pier in a S.E. direction from Lion point, forming, with the South pier extension, a new port with an entrance about 1⅓ cable

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in width. A passage will be opened near the centre of the North pier to afford communication between the new and old ports.

63.—MEDITERRANEAN.—*Italy.—West Coast.—Naples Roads.—Alterations in Lights and Buoys.*—The following alterations have been made in the lights and buoys in Naples roads, west coast of Italy :—(1.) A fixed *red* light is exhibited from a post, placed at the centre of the western head of the eastern mole, with the light-house at the extremity of San Vincenzo mole bearing S., distant $3\frac{8}{10}$ths cables. Position, lat. 40° 50′ 20″ N., long. 14° 16′ E. (2.) The light buoy, showing a fixed *green* light, hitherto marking the submerged western head of the eastern mole, has been withdrawn. (3.) Two fixed *green* lights, placed vertically, are exhibited from a post at the head of the curvilinear, or south-eastern part of the eastern mole, with the lighthouse at the extremity of San Vincenzo mole bearing S.W. by S., distant $3\frac{3}{10}$ths cables. The light buoy moored off this extremity of the eastern mole exhibits a fixed *green* light. Position, lat. 40° 50′ 18″ N., long. 14° 16′ 16″ E. (4.) The fixed *green* light, hitherto shown from the north-eastern extremity of S. Gennaro mole, has been discontinued, and replaced by an *occulting red* light, with occultations *every five seconds*. Position, lat. 40° 50′ 20″ N., long. 14° 15′ 42″ E. Further notice will be given of the visibility of these lights. The harbour works of the eastern mole, above-mentioned, include a breakwater in course of construction, which extends from the coast southward of Carmine fort in a S. $\frac{1}{4}$ W. direction for a distance of about 720 yards; there it divides into two heads, the western running W. by N. about 160 yards, and then W. by S. $\frac{1}{4}$ S. 130 yards to its extremity ; and the south-eastern head, in a curved form, about S. by E. $\frac{1}{2}$ E. 260 yards.

Note.—As bad weather may occasionally prevent the exhibition of the fixed green lights at the extremity of the curved portion of the eastern mole, mariners are cautioned to keep a good look-out for the light buoy marking that extremity of the eastern mole. The two light buoys, hitherto marked on the Admiralty chart, south-westward of the stony pit extending from the shore about four cables eastward of the eastern mole, do not exist. *Variation* 10° *W.*

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64. — MEDITERRANEAN. — *Ionian Sea.—Greece. — Cephalonia Island.—Intended Re-Exhibition of Guardiana Island Light.*— With reference to notice in 1889, on the temporary discontinuance of Guardiana island light, south coast of Cephalonia island, pending the establishment of a new illuminating apparatus, probably in March, 1890, the light will be re-exhibited from the old light-house. It will be a *fixed red* light. Illuminating apparatus, dioptric, or by lenses, of the fifth order. Position, lat. 38° 8¼′ N., long. 20° 26½′ E.

65.—MEDITERRANEAN.—*Ionian Sea.—Santa Maura Island.— Light on Cape Dukato, and Discontinuance of Provisional Light.*— With reference to notice in 1889, on the exhibition of a provisional light *(fixed red)* on cape Dukato, south-western point of Santa Maura island, Ionian sea, on 13th January, 1890, a light would be exhibited from a lighthouse recently erected about 382 yards north-eastward of cape Dukato, and the provisional light discontinued. The light is a *fixed white* light, varied by *white flashes of ten seconds'* duration *every minute;* it is visible over an arc of 288°, or between the bearings of S. 1° W., through east, and S. 73° W. A sector of fixed white light is faintly visible in Vasilico bay, between the bearings of S. 49° W. and S. 61° W.; and in clear weather the fixed white light may be faintly seen, when within a distance of 8 miles from the light, eastward of the bearing S. 1° W., or over Sesola rock to the land. Near the limits of the arc of visibility the flashes are very faint and of short duration, gradually increasing in power as the arc of light is entered, but are only completely visible, between the bearings of S. 16° E., through east and north to West. The light is elevated 229 feet above the sea; the fixed light should be seen 20 miles, and the flashing light 22 miles. Illuminating apparatus, dioptric, or by lenses, of the third order. The lighthouse, 44 feet high, is square in shape, and constructed of masonry, with the keeper's dwelling near. Position, lat. 38° 33′ 50″ N., long. 20° 33′ 50″ E. *Variation*, 7° *W.*

66.—MEDITERRANEAN.—*Adriatic.—Eastern Shore.—Additional Harbour Light at Fiume.*—On 5th December, 1889, a light would be exhibited from a wooden beacon, moored at the outer extremity of the submerged portion of a mole (No. IV.) in course of con-

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struction at Fiume. It is a *fixed white* light. The beacon, pyramidal in shape, and from which a red flag is shown during the day, is moored with Rudolf mole (No. III.) bearing E.S.E., distant 434 yards, and the north shore of the harbour N.N.E., distant 220 yards.

Note.—Vessels must pass between the Outer breakwater (Maria Teresa mole) and the above-mentioned light beacon. *Variation*, 10° *W.*

67.—MEDITERRANNEAN.—*Egypt.—Port of Alexandria.—Information Concerning Time-Signal and Fire-Signals.*—Information concerning the time-signal, and establishment of fire-signals, at the port of Alexandria. (1.) A gun is fired from the guard-ship *Mahomet Aly* at noon daily, when the ball is dropped the first time at the signal station on Kom El Nadoura (fort Caffarelli). (2.) The fire-signals are—One gun fired from the guard-ship signifies a fire in the town; a second gun, fired two minutes after the first, signifies a fire in the harbour, near the coast, or amongst the shipping.

Note.—The *Mahomet Aly* is moored in the inner harbour, with the lighthouse on the Inner mole head bearing S.W. ¾ W., distant 2 cables. *Variation*, 5° *W.*

68.—AFRICA.—*West Coast.—Wreck on Shoal in St. Ann Bay.*—The French steam-vessel *Condé* lies wrecked on a shoal in St. Ann bay, 65 miles northward of cape Blanco, west coast of Africa. This shoal appeared to be about one mile off shore in the entrance to the bay; and the sea was breaking heavily round it. Position, approximate, lat. 21° 53′ N., long. 16° 58′ W.

69.—AFRICA.—*Gulf of Guinea.—Bonny River.—Discontinuance of Coal Depôt.*—The coal depôt near Bonny town, Bonny river, gulf of Guinea, has been abolished. Position, lat. 4° 26′ N., long. 7° 9′ E.

70.—NORTH ATLANTIC.—*Canary Islands.—Gran Canaria.—Puerto De La Luz.—Lights Marking Wreck off Mole.*—With reference to notice in 1889, on a *green* light being exhibited from a wreck lying 1¼ cable S.S.E. from the outer extreme of the mole in course of construction at Puerto de la Luz, Gran Canaria, Captain Dupont of the French vessel-of-war, *Iphigénie*, reports

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that on 18th November, 1889, the masts of the wreck (steam-vessel *South America*), were not visible above water, and that it was marked by a white boat, exhibiting *two green* lights. At that date, the works of the mole had been advanced to a distance of 584 yards from the shore, and the extreme bore from the wreck N. 68° W., distant $1\frac{1}{10}$th cable. *Variation*, 19° *W.*

71.—AFRICA.—*East Coast.—Zanzibar Island.—Light on Mwana Mwana Island.*—A light is now exhibited from a lighthouse (construction commenced in 1881) on the north extreme of Mwana Mwana island, N.W. coast of Zanzibar island; it is a *fixed white* light. Position, lat. 5° 45′ 10″ S., long. 39° 13′ 10″ E.

Note.—The regular exhibition of this light should not be relied on.

72.—INDIA.—*West Coast.—Gulf of Cutch.—Mandvi Permanent Light Exhibited.*—With reference to Notice 28, p. 70, on the discontinuance of Mandvi light, pending the fitting of a new illuminating apparatus, and the exhibition of a provisional light from the breakwater head, on 21st December, 1889, the permanent light would be exhibited from the old lighthouse, Mandvi. The light is a *group flashing* white light, showing *three flashes* at short intervals, *every thirty seconds;* elevated 115 feet above H.W., and visible from a distance of 18 miles. Illuminating apparatus of the fourth order. Position, lat. 22° 50′ N., long. 69° $20\frac{1}{4}$′ E.

73.—BAY OF BENGAL.—(1.) *Calcutta and Approaches.—Additional Storm Signal.*—The following cautionary signal has been adopted in connection with the previously existing storm signals for the port of Calcutta and approaches:—Two balls, hoisted vertically, indicate the existence of disturbed weather in the northern part of the bay of Bengal. The disturbed conditions may consist of squally weather with strong winds to the southward, which may shortly pass away, or which may be the first stage in the formation of a cylonic storm.

(2.) *Coasts of Orissa and Burma.—Storm Signals.*—Storm signals, practically identical with those in use on the coast of Madras, are adopted on the coasts of Orissa and Burma.

Orissa Coast.—Storm signal stations are established at Puri (Pooree), False point (at Huki tala), Balasor, and Chandbali.

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Burma Coast.—Storm signal stations are established at Akyab, Bassein, Rangoon, and Moulmein.

74.—China Sea.—*Singapore Western Approach.—Salat Sinki.—Ajax Shoal.—Intended Light-Vessel Exhibiting a Flashing Light, and Withdrawal of Bell Buoy.*—On 1st February, 1890, a light-vessel will be moored on Ajax shoal, west side of Salat Sinki, western approach to New harbour, Singapore. The light will be a *flashing* white light, showing a *flash every thirty seconds;* elevated 38 feet above the sea, and visible from a distance of 10 miles. The light-vessel will be painted yellow, with the word *Ajax* in white letters on a black ground, on her sides. She will carry a caged ball, painted red, at the masthead, as a day mark. Position, lat. 1° 13′ 55″ N., long. 103° 40′ 20″ E. Also, on the same date, the bell-buoy now marking Ajax shoal will be withdrawn.

75.—Eastern Archipelago.—*Surabaya Strait.—Buoys Marking Prohibited Anchorage near Submarine Telegraph Cable.*—In order to protect the submarine telegraph cable, laid between Tjankring, Java, and Tanjongang, Madura, across Surabaya strait, from vessels anchoring near it, two small iron nun-buoys have been placed on each side of the shore ends of the cable. The buoys near the Java coast are painted white, those near Madura are painted black. Vessels are prohibited from anchoring in the area of which the northern limit is the line joining the northern buoys, and the southern, that joining the southern buoys.

76.—China.—*East Coast.—Amoy Inner Harbour.—Time Signal at North Point of Kulangseu.*—A time signal has been established on the north-eastern slope of Wellington's Nose, northern point of Kulangseu, Amoy inner harbour. The signal is a gun, which is fired on Wednesdays and Saturdays, at noon, Amoy Custom House mean time, equivalent to 16h. 7m. 43.9s. Greenwich mean time. The flag T of the International Code is hoisted at the flagstaff about five minutes before signal, and hauled down at the instant of the signal. Should there be any error in the signal, the flag is kept at half-mast for 10 minutes. Position of signal, lat. 24° 27′ 25″ N., long. 118° 3′ 33″ E.

77.—Australia.—*West Coast.—Shark Bay.—Gascoyne Road.—Temporary Light-Vessel Exhibiting a Fixed Light.*—The receiving

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hulk of the Adelaide Steam Navigation Company, exhibiting a fixed light, is moored off the entrance of Gascoyne river, Gascoyne road, Shark bay. The light is a *fixed white* light, shown from the mast of the light-vessel; it is elevated 39 feet above the sea, and visible from a distance of 10 miles. The light-vessel, with one mast, is painted red. She is moored in 18 feet at L.W., with the beacon on the south end of Babbage island bearing E. by N. ½ N., distant 1⅜ mile. Position, lat. 24° 54′ 5″ S., long., 113° 37′ 5″ E. *Variation*, 2° *W.*

Note.—Mariners are cautioned that this light may be liable to be discontinued, and implicit reliance should not be placed upon it.

78.—AUSTRALIA.—*East Coast.—Intended Group Flashing Light on Smoky Cape.*—It is intended to exhibit a light from a light-house now in course of erection on Smoky cape. It will be a *group flashing* light of the first order. Position, as given, lat. 30° 56′ S., long. 153° 6′ E. Further notice will be given.

79.—AUSTRALIA.—*East Coast.—Ulladulla Harbour.—Light on Warden Head, and Discontinuance of Pier Light.*—On 1st December, 1889, a light would be exhibited from a lighthouse recently erected on Warden head, south side of entrance to Ulladulla harbour. It is a *fixed white* light, visible from a distance of about 12 miles. Position, approximate, lat. 35° 22¼′ S., long. 150° 31¼′ E. Also, on the same date, the light (fixed *green*) previously shown from the pier head, Ulladulla harbour, would be discontinued.

80.—AUSTRALIA.—*East Coast.—Moreton Bay.—Westerly Extension of East Bank.*—In consequence of the further westerly extension of East bank, north-westward of Moreton island, Moreton bay, vessels when passing westward of that bank must, by night, keep Tangaluma light open westward of Cowan Cowan light, once and a-half the difference of their heights; and by day, must keep Cowan Cowan lighthouse open to the eastward of the left shoulder of the high land of Tangaluma.

81.—SOUTH PACIFIC.—*Fiji Islands.—Non-Existence of Alfred and Calinon Reefs.*—The non-existence of the reported Alfred and Calinon reefs, southward of the Fiji islands, has been established from a recent search by Commander C. F. Oldham, in H.M. surveying-vessel *Egeria*. Alfred reef was originally reported by the master of an American ship as being "one of many rocks having

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each an extent of about one acre, and about two fathoms water over them." Calinon reef was originally reported by the master of a British ship, as "being a quarter of a mile in extent, and two or three feet above the sea, with no appearance of vegetation on it." No corroborative reports concerning these reefs have been received, but in 1880, H.M. surveying-vessel *Alert* passed over the position of Alfred reef, when no appearance of a shoal could be detected from aloft, and no bottom could be obtained at 300 fathoms. The present search for the reefs by the *Egeria* was made between 13th and 17th September, 1889, when positive soundings were obtained around the reported positions. The least depth found near the position of Alfred reef (lat. 20° 10′ S., long. 179° 15′ E.) was 1,876 fathoms. The least depth found near the position of Calinon reef (lat. 20° 22′ S., long. 179° 20′ W.) was 1,240 fathoms, brown mud. The water shoaled gradually between the two positions, and the soundings obtained around them did not lead to any suspicion of shoal water in either. The weather during the time was exceptionally fine, and excellent observations were obtained for fixing the ships' positions, a good look-out was kept, and no indication of a danger was seen, but large quantities of sea sawdust in thick patches were observed. On one day, breakers were reported from aloft, and the appearance of the water was such as to deceive nearly all the officers, the supposed breakers however proved to be the sun-light reflected from the sloping side of the swell. Taking the vague nature of the original reports of these reefs into account, the present search by Commander Oldham is considered to disprove them, and both Alfred and Calinon reefs have been expunged from the Admiralty charts.

82.—North America.—*West Coast.—Current Floats Adrift.*—Lieutenant and Commander C. H. Stockton, U.S.S. *Thetis*, has reported that during the summer of 1889, while on the north and N.W coast of Alaska, numerous drift floats were set adrift from that ship. These floats are made of wood, about 2 feet long and 9½ inches thick, with the name of the ship, date, and the words "for drift" cut upon the face. In a cavity at one end of the float, plugged with soft wood, there is a copper cylinder containing a letter requesting the finder to inform the U.S. Hydro-

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graphic office, Washington, D.C., the nearest U.S. Consul, or the Commanding Officer of the *Thetis*, the time and place where the float was found. These floats are intended to show the direction and strength of the currents off the coast of Alaska, and any information obtained from them will be of value to navigation. Mariners, or others, finding any of these floats are strongly urged to comply with the request contained therein.

83.—North America.—*West Coast.—British Columbia.—Strait of Georgia.—Mayne Island.—Sunken Rock off Edith Point.*—Commander W. M. Annesley, H.M.S. *Icarus*, reports the existence of a sunken rock in the patch of kelp lying off Edith point, north coast of Mayne island. The rock is situated 1¼ cable E. by S. from Edith point; the least depth found on it was 2 feet, with irregular soundings around. Position, lat. 48° 51′ 15″ N., long. 123° 14′ 50″ W. *Variation*, 23° *E.*

84.—North America.—*U.S. Pacific Coast.—Oregon.—Light on Cape Meares.*—On or about 1st January, 1890, a light will be exhibited from a lighthouse recently erected on the western extremity of cape Meares. It will be a *fixed white* light of the first order, varied by a *red flash every minute*, elevated 220 feet above H.W., and visible from a distance of about 21 miles. The lighthouse is a low white tower in the shape of a truncated octagonal pyramid, with black lantern; the keeper's dwelling (white) and store houses (brown) are situated eastward of the tower. Approximate position, lat. 45° 30′ N., long. 123° 57′ W.

85.—North America.—*U.S. Pacific Coast.—California.—San Diego Bay.—Harbour Lights.*—On 15th November, 1889, the five harbour lights, as undermentioned, were exhibited in San Diego bay:—

Ballast point ...	A fixed *white* light	On western side of the channel.
La Playa ...	A fixed *white* light	
Beacon No. 2 ...	A fixed *red* light	On eastern and southern sides of the channel.
Beacon No. 6 ...	A fixed *red* light	
Diamond beacon (between Nos. 6 and 8)	A fixed *red* light	

Note.—Ballast point and La Playa lights in line lead about

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50 yards eastward of the outer bar buoy. The red light on beacon No. 2 is not visible, approaching from seaward, till nearly abreast Ballast point. No private lights will be allowed to be shown from any of the beacons in the lower bay.

86.—South America.—*Magellan Strait.—Queen Channel.—Buoy Marking South-Western Part of Walker Shoal.*—A buoy has been placed on the south-western part of Walker shoal, east side of Queen channel, Magellan strait. This buoy is a conical buoy, painted red, with the word *Walker* on it in white letters, surmounted by a staff and globe, painted white. It is moored in 33 feet at L.W., with cape Thorax bearing N. 79° W., distant 3¼ miles; and western extreme of Sta. Marta N. 16° E. Position, lat. 52° 56′ 50″ S., long. 70° 41′ 35″ W. *Variation*, 20° *E.*

Caution.—No confidence can be placed on this buoy maintaining its position.

87.—South America.—*East Coast.—Venezuela.—River Orinoco. —Withdrawal of Light-Vessel at Entrance, and Alterations in Channel.*—The master of the steam-vessel *Elgiva* reports that the light-vessel, formerly moored off Barima point, Boca Grande, entrance of river Orinoco, has been withdrawn, and is now stationed about 12 miles up the river Orinoco, in the bight between Cangrejo and Telzereo islands, where she is used as a station for the river pilots. Also, that Telzereo island has formed since the last survey of the river was made. It is about 1½ mile in length in an E. and W. direction, and covered with trees about 20 feet high; being situated eastward of the south-eastern extremity of Cangrejo island, with only a boat passage between. New islands are forming to the northward and eastward of Telzereo island, and Cangrejo bank has apparently extended greatly to the southward. There is at present much less water on Cangrejo bank, and in the channel southward of it, than indicated in the chart, depths of 7 and 8 fathoms having been found where formerly there were 13 to 15 fathoms. The least depth obtained by the *Elgiva*, in four passages across the bar, was 2¾ fathoms. *Variation*, 1° *W.*

88.—United States.—*Additional Storm Signal.*—With reference to notice in 1887, on the exhibition of storm signals on the shores of the Atlantic ocean, gulf of Mexico, and Great lakes,

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United States, on 1st December, 1889, the following signal would be adopted as one of the storm signals of the United States. The signal (*Information Signal*) is a *yellow pendant*, and indicates that the local observer has received warning of a storm covering a limited area, dangerous only for vessels about to sail to certain ports. The necessary information, relative to the storm, will be given to masters of vessels upon application to the local observer. It is believed that the display of the Information Signal, will, in many instances, obviate the necessity for the exhibition of the Cautionary Signal (yellow flag with white centre).

Note.—The night signal for indicating westerly winds is a *white* light above a *red* light.

89.—United States.—*Maryland.—Potomac River.—Light and Fog-Signal at Entrance of Wicomico River.*—On or about 25th December, 1889, a light would be exhibited from a lighthouse recently erected at the south-eastern extreme of the shoal extending south-eastward from Cob point, western side of entrance to Wicomico river, northern side of Potomac river, Maryland. It is a *fixed white* light, elevated 40 feet above the sea, and visible from a distance of 11 miles. Illuminating apparatus, of the fourth order. The lighthouse consists of an iron screw pile foundation, painted brown, surmounted by a square wooden dwelling, painted white, with a brown roof, and a black lantern above. It is situated in a depth of 6 feet, with Blakistone island lighthouse bearing S.E. by E. $\frac{1}{4}$ E., distant $4\frac{1}{3}$ miles, and Cob point N.W. $\frac{1}{4}$ N., $1\frac{1}{8}$ mile. Position, as given, lat. 38° 14′ 27″ N., long. 76° 49′ 32″ W. *Variation*, 4° *W.* Also, on the same date, a fog-signal would be established at the above lighthouse. The signal is a bell, which, during thick or foggy weather, will be struck by machinery, a double blow *every fifteen seconds.*

90.—United States.—*New York.—East River.—Fog-Signal near Hallett Point Lighthouse.*—On or about 16th December, 1889, a fog-signal would be established in a small tower, near Hallett point lighthouse, eastern shore of East river, New York. The signal is a bell, which, during thick or foggy weather, will be struck by machinery, a single blow *every five seconds.* Position, lat. 40° 46′ 35″ N., long. 73° 56′ 5″ W.

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91.—UNITED STATES.—*Maine.—Frenchman Bay.—Light on Crabtree Ledge.*—On or about 15th January, 1890, a light will be exhibited from a lighthouse recently erected on Crabtree ledge, eastward of Crabtree neck, northern side of Frenchman bay, Maine. It will be a *fixed white* light, varied by a white *flash every two minutes;* elevated 48 feet above H.W. Illuminating apparatus, of the fifth order. The lighthouse consists of a brown conical iron tower, resting on a black cylindrical foundation pier, and surmounted by a black lantern. A roofed gallery surrounds the base of the tower. It is situated in a depth of about 15 feet, 2 cables from the shore. Position, lat. 44° 28′ 18″ N., long. 68° 13′ 15″ W. *Variation*, 17° *W.*

92.—GULF OF ST. LAWRENCE.—*Prince Edward Island.—South Coast.—Hillsborough Bay.—Leading Lights on Hazard Point.*—On 15th December, 1889, two leading lights would be exhibited on Hazard point, eastern side of entrance to Charlottetown harbour, Hillsborough bay, south coast of Prince Edward island. The front light is a *fixed red* light, elevated 45 feet above H.W., and visible from a distance of 8 miles. It shows over a small arc on each side of the direction of the lights in line. Illuminating apparatus, catoptric, or by reflectors. The front lighthouse, square in shape, constructed of wood, painted white, and 47 feet in height, is situated on Hazard point, 35 feet from the coast. Position, lat. 46° 11′ 50″ N., long. 63° 4′ 5″ W. *Variation*, 24° *W.* The rear light is a *fixed red* light, elevated 125 feet above H.W., and visible from a distance of 12 miles. It shows over a small arc on each side of the direction of the lights in line. Illuminating apparatus, catoptric, or by reflectors. The rear lighthouse, square in shape, constructed of wood, painted white, and 47 feet in height, is situated behind the buildings of Bellevue farm, and bears about N.E., distant 2,244 feet from the front lighthouse. These lights will be exhibited throughout the season of general navigation; and during winter, whenever any steam-vessels are running to Charlottetown.

Note.—Vessels should bring these lights in line, bearing about N.E., when north-westward of point Prim; and keep them in line, passing westward of the bell buoy on Fitzroy rock, until Blockhouse point light bears N. ¼ W., when course should be altered to pass

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eastward of St. Peter's Spit buoy, and towards the entrance of Charlottetown harbour.

NORTH SEA.—*Cautionary Notice respecting Sunken Wrecks Northward of Schowen Bank Light-Vessel.*—The master of the steam-vessel *Vigsnæs* reports that at 4h. 30m. p.m., 28th December, 1889, when proceeding from the Scheldt towards the Tyne, he passed two sunken wrecks, probably those of the steam-vessels *Leerdam* and *Gaw Quan Sia*, lying about N. ¼ W., respectively 24 and 25 miles, from Schowen bank light-vessel. The topmast of the southern wreck, and two topmasts of the northern one, were showing above water. Position, southern wreck, lat. 52° 10′ N., long. 3° 14′ E.; position, northern wreck, lat. 52° 11′ N., long. 3° 13′ E. These wrecks present danger to shipping. *Variation*, 15° *W.*

OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,
20th January, 1890.

THE following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

NOTE.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
2011	Holyhead Harbour	Soundings. December.
2296	Gulf of Bothnia, Sheet I. ...	Correction of Beacons. December.
117	Mediterranean: the Faro or Strait of Messina	New Chart. December.
253A	Africa, E.: Jebel Jan to Seyara	Plan: Khor Ambada anchorage. December.

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Chart No.	Title of Chart.	Nature and Subject of Correction.
985	Pacific, S.: Minerva reefs ...	Relative positions altered and additional soundings. December.
1610	England, E.: North Foreland to Orfordness	W. Swin and Middle Deep to Duke of Edinburgh Channel. January.
1267	Do. S.: Approaches to Plymouth	New Chart. January.
121	Sweden, W.: Koster islands, and approaches to Strömstad	Numerous new shoals, etc. Dec.
196	Do. Nidingen to Hönö...	Corrections to buoys and beacons. December.
129	Do. Hönö to the Paternosters	Corrections and additions to Shoals. December.
2116	Great and Little Belts... ...	Numerous corrections throughout. January.
2115	The Sound	Extensive corrections to lights and buoys. December.
2414	Gulf of Siam	Great Redang island to Pahang. December.
389	China, E.: Shanghai harbour...	New Chart. December.
2491	North America, E.: Approaches to New York...	Extensive corrections throughout. January.

Agent for the sale of Admiralty Charts, Mr. J. D. Potter, 31, *Poultry, London, E.C.*

The Board of Trade have awarded the undermentioned testimonials to the crews of the Brazilian tugs *Plata* and *Emperor*, in recognition of their services in assisting to rescue the crew of the British barque *Georgina*, which was wrecked in a storm on English Bank, in the River Plata, on the 21st August last:—A gold medal for humanity to Antonio Fassio, master of the *Plata*, a gold medal for gallantry, and a sum of money, to Cristobal di Franco, seaman of the *Plata* (who, at great personal risk, rescued the shipwrecked crew), a silver medal for humanity to Benito Borrazas, master of the *Emperor*, and sums of money to the remaining members of both crews.

The Board of Trade have awarded a gold medal to Claus Berntsen Lodre, a Norwegian pilot, and a silver medal to Claus Pedersen Lodre, his grandson, together with sums of money to both persons, in recognition of their services in rescuing the survivors of the shipwrecked crew of the s.s. *Hartlepools*, of

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West Hartlepool, which stranded near Egersund, Norway, on the 6th December, 1888.

The Board of Trade have awarded a binocular glass to Mr. Theodore Colcord, master of the vessel *A. J. Fuller*, of New York, in recognition of his services in rescuing the shipwrecked crew of the British s.s. *Santiago*, of Hull, which was wrecked in the North Atlantic on the 19th November, 1889.

The Board of Trade have received through the Consul-General for Sweden and Norway the undermentioned rewards, which have been made by the Norwegian Government to the crew of the Point of Ayr lifeboat, in recognition of their services in rescuing the shipwrecked crew of the Norwegian ship *Mount Pleasant*, on the 7th October, 1889:—A silver medal of the second class to Benjamin Evans, master; and silver medals of the third class to John Silcock, William Evans, Thomas Hughes, Thomas Wilson, Henry Parry, George Jones, John Lloyd, Edward Roberts, John Williams, William Roberts, John Jones, and Robert Roberts, the crew of the boat.

The Board of Trade have awarded a gold watch to Mr. Henry Buschman, master of the steamship *Pennland*, of Antwerp, in recognition of his services in rescuing the shipwrecked crew of the British schooner, *Juan*, of Salcombe, which was wrecked at sea on the 20th December, 1889. The Board have also awarded a gold medal to Mr. H. Doscreed, chief officer of the *Pennland*, and silver medals and sums of money to the seamen, J. Stelfen, J. Dreeman, J. Van der Heydon, and J. Vermeulen, who accompanied the mate in the *Pennland's* lifeboat, and took the shipwrecked men off the wreck under circumstances of great risk and difficulty.

Official Inquiries at Home, 1889-90.

3942. *Minna*, s.s.; built at Govan, 1865; owned by Mr. R. Grandige; tonnage, 438; Liverpool to Copenhagen; coke; stranded on Quoy's Ledge, Pentland Firth, November 20, 1889.

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Inquiry held at Liverpool, December 12, 1889, before Raffles, Judge; Bain and Bragg, N.A. Casualty owing to vessel having been navigated throughout in dangerous proximity to coast. Certificate of master suspended for three months.

3943. *Elizabeth*, barge, and *Madeline*, s.s.; former built at Sittingbourne, 1858; owned by Messrs. Smeed, Dean & Co., Limited; tonnage, 34; Sittingbourne to Bow; flints; latter built at Hartlepool, 1874; owned by Mr. T. Bell and others; tonnage, 820; Soderhamn to London; deals; in collision above West Blyth Buoy, Thames, October 30, 1889, when former sank and one life was lost. Inquiry held at North Shields, December 12, 1889, before Jackson and Robson, Justices; Powell, Anderson, and Richardson, N.A. Collision caused by *Madeline* crossing the river at too great a rate of speed, and not stopping and reversing when the green light of the *Elizabeth* was first reported. Certificate of master suspended for six months.

3947. *Coptic*, s.s.; built at Belfast, 1881; owned by Oceanic Steam Navigation Co., Lim.; tonnage, 2,857; Wellington, N.Z., to London; general and passengers; stranded on Mai Island, Brazil, October 12, 1889. Inquiry held at Westminster, December 16, 1889, before Marsham, Judge; Parfitt and Baker, N.A. Stranding owing to master hauling up on to an E.S.E. course before getting clear of islands off Rio. Certificate suspended for six months.

3948. *Hannah*, brigantine; built at Fortune Bridge, P.E.I., 1875; owned by Mr. Randell; tonnage, 190; Mossoro to Paranagua; salt; stranded on Mossoro Sands, Brazil, October 22, 1889. Inquiry held at Swansea, December 19, 1889, before Fowler, Judge; Davies and Richardson, N.A. Stranding owing to culpable conduct of master and mate in allowing vessel to be run ashore by the coasting pilot. Certificates suspended for two years and one year respectively.

3949. *Eriminta*, ship; built at St. John, N.B., 1867; owned by Mr. T. J. Dixon; tonnage, 1,213; Liverpool to St. John, N.B.; ballast; stranded in Luce Bay, Wigton, November 21, 1889. Inquiry held at Liverpool, December 21, 1889, before Raffles, Judge; Wilson and Cosens, N.A. Stranding owing to a N.E. by E.

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course having been continued too long from off Rockabill Lighthouse, and to the Mull of Galloway Light having been mistaken for South Rock Light. Certificates of master and mate suspended for twelve and three months respectively.

3959. *Mauritania*, s.s., and *Sirio*, Italian barque; former built at West Hartlepool, 1871; owned by Mr. N. Cameron and others; tonnage, 480; in collision in Penarth Roads, October 7, 1889, when one life was lost. Inquiry held at Liverpool, January 1, 1890, before Raffles, Judge; Anderson, French and Laing, N.A. Casualty caused by *Mauritania* dragging her anchor, subsequently parting her cable, and driving on to the *Sirio*, which was at anchor. Certificate of mate suspended for three months for not steaming ship out into a clear berth as soon as she began to drag.

3961. *Rossini*, s.s.; built at Sunderland, 1878; owned by Mr. J. Taylor and others; tonnage, 915; Clyde to Bilbao; ballast; stranded off Holy Island, came off damaged and unmanageable, and stranded off Clachland Point, Arran, December 3, 1889. Inquiry held at Greenock, January 1, 1890, before Begg, Judge; Parish and Castle, N.A. Casualty caused by vessel having been kept on too fine a course in hazy weather. Master censured.

3962. *Mauritania*, s.s.; built at West Hartlepool, 1871; tonnage, 480; Cardiff to Barcelona; coal; stranded 3 miles W. of Sabinal Lighthouse, Spain, October 29, 1889. Inquiry held at Liverpool, January 2, 1890, before Raffles, Judge; Anderson and French, N.A. Stranding due to master steering a course which took vessel directly on to the land, and to second mate allowing vessel to run on shore in broad daylight within a very short distance of the beach. Certificates suspended for six and three months respectively.

3964. *Earl of Durham*, s.s.; built at Sunderland, 1854; owned by the Earl of Durham; tonnage, 403; Sunderland to Amsterdam; coal; stranded S. of Egmond, Holland, December 20, 1889. Inquiry held at Sunderland, January 9, 1890, before Potts and Stokoe, Justices; Anderson and Bragg, N.A. Stranding due to master during a fog continuing on a course leading directly towards the land after water had shoaled to 9½ fathoms. Certificate suspended for three months; recommended for one as mate.

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3965. *Janet*, brig; built at Aberdeen, 1867; owned by Mr. A. Scroggie and others; tonnage, 215; Pillau to Tyne; deals; stranded off Newbiggin, December 12, 1889. Inquiry held at North Shields, January 8, 1890, before Jackson and Morrison, Justices; Wilson and French, N.A. Stranding due to vessel having been kept heading towards the land after the lead showed 15 fathoms. Certificates of master and mate suspended for six months each.

INQUIRY BY INSPECTOR, 1889.

33. *Queensmore*, s.s.; built at Belfast, 1889; owned by Mr. W. Johnson; tonnage, 2,767; Baltimore to Liverpool; general; cargo found to be on fire in lat. 50° N., long. 32° 30′ W., navigated still burning for four days, and when nearly unmanageable stranded during a fog off Three Castle Head, Ireland, November 8, 1889. Inquiry held at Liverpool, November 30, 1889, before Bragg, Inspector. No evidence as to cause of fire, which apparently originated in bales of cotton stowed near air shaft. Greater security would be obtained if the apertures in air shafts were closed by iron doors, instead of by a plank secured by a stanchion liable to be displaced in stowing bales of cotton.

FISHERY INQUIRIES, 1889.

S. 34. *Discovery*, ketch; built at Hull, 1879; owned by Mr. W. J. Robins; tonnage, 77; Dogger Bank to Hull; stranded near Hayburn Wyke, Yorkshire, November 22, 1889. Inquiry held at Hull, December 9, 1889, before Stratten and Brodrick, Justices; Harland and Cunninghame, N.A. Stranding due to skipper continuing to stand too long towards the land on a foggy night, and not sufficiently using the lead. Fishing vessels should be provivided with charts.

S. 35. *Almoner*, dandy, and *General Gordon*, ketch; former built at Elmshorn, 1878; owned by Great Grimsby Ice Co., Lim.; tonnage, 78; latter built at Grimsby, 1885; owned by Mr. W. S. Stockwood; tonnage, 80; in collision in North Sea, November 7, 1889, when former sank, and two lives were lost. Inquiry held

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at Grimsby, December 18, 1889, before Veal and Oates, Justices; Knox, Hore and Cunninghame, N.A. Collision owing to reckless navigation of third-hand of *Almoner* in putting the helm up before looking to leeward.

OFFICIAL INQUIRIES ABROAD, 1889.

3941. *Garston*, ship; stranded off Starbuck Island, South Pacific, July 17, 1889. Inquiry held at Tonga, September 9, 1889. Stranding owing to chronometers putting vessel from 30 to 40 miles too far to the eastward. Master censured for not ascertaining their error.

3944. *Ino*, ketch; wrecked on Kiama Breakwater, September 17, 1889. Inquiry held at Sydney, N.S.W., October 5, 1889. Stranding owing to careless navigation of master. Certificate suspended for three months.

3945. *Taroba*, s.s.; struck an unmarked 15-foot reef lying N.E. ½ N. of Round Top Island, and sustained damage, October 10, 1889. Inquiry held at Brisbane, November 1, 1889. Master not to blame as the chart showed 7 fathoms.

3946. *Santiago*, s.s.; destroyed by fire when two days out on voyage from New York to Hull, November 19, 1889. Inquiry held at New York, December 6, 1889. No evidence as to cause of fire which originated in hold where cotton and clover seed were stowed.

3950. *Phaeton*, barque; burnt at Cocos-Keeling Islands, September 25, 1889. Inquiry held at Singapore, November 11, 1889. Evidence not sufficient to prove positively cause of fire, which originated amongst cargo of copra and dunnage of palm fronds, but natives stowing cargo had been seen smoking in the hold.

3951. *Cornucopia*, s.s.; stranded on Fish Cay Bar, Crooked Island Passage, November 7, 1889. Inquiry held at Long Cay, Fortune Island, November 9, 1889. Stranding owing to a strong easterly current.

3952. *William Davie*, barque; abandoned on fire off Cape Horn, October 17, 1889, when on voyage from Fleetwood to Valparaiso. Inquiry held at Stanley, Falkland Islands, October 23, 1889. Fire owing to spontaneous combustion of cargo of coal.

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3953. *Amoy*, ship; stranded at Point William, East Falkland, October 28, 1889. Inquiry held at Stanley, Falkland Islands, November 4, 1889. Stranding due to vessel being unmanageable owing to the foul state of her bottom, and to the boisterous weather.

3954. *Montreal*, s.s.; stranded on Belle Isle, August 4, 1889. Inquiry held at Quebec, September 13, 1889. Stranding owing to fog and irregular currents, to numerous icebergs making it necessary to continually change the course, and to the half-hourly gun on the island not having been heard.

5955. *Koranui*, s.s.; stranded on Piege Rocks, South Island, N.Z., September 27, 1889. Inquiry held at Wellington, N.Z., October 2, 1889. Stranding due to master not retracing his course when in a dangerous position. Certificate suspended for two months, and ordered to pay costs, £7 7s.

3956. *Hattie E. Tapley*, barque; stranded on Chek Wan, Samoan Group, November 1, 1889. Inquiry held at Hong Kong, November 12, 1889. Stranding due to master attempting to pass to windward of the Group in a light wind. Vessel had no certificated mates, and was not supplied with adequate sailing directions.

3957. *Northern Empire* and *Cynosure*, barques; in collision, when former was at anchor off Rio, October 29, 1889. Inquiry held at Rio de Janiero, November 22, 1889. Collision owing to *Cynosure* not letting go her anchor.

3958. *Willie McLaren*, barque; stranded on Steeple Rock, Wellington Harbour, N.Z., October 5, 1889. Inquiry held at Wellington, N.Z., October 11, 1889. Loss owing to master not making another board. Ordered to pay costs, £4 4s.

3960. *Madura*, s.s.; loss of second and fourth engineers at Moulmein, October 31, 1889. Inquiry held in Burma. Casualty owing to the two men attempting to quicken the emptying of boiler by removing the bars from boiler door, when the door suddenly fell in, and the men were scalded by the rush of steam and boiling water.

3963. *Sea Nymph*, barque; stranded on a reef off New Caledonia, October 28, 1889. Inquiry held at Noumea, November 7,

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1889. Stranding owing to master's absence from deck, and to second mate not keeping a proper look-out. Case should be investigated by Marine Board of Sydney.

3966. *Brenda*, ship; stranded at mouth of Corentyne River, but sustained no damage, November 6, 1889. Inquiry held at Georgetown, Demerara, December 6, 1889. Stranding due to an error with regard to current, and to soundings not having been carefully taken. Master cautioned.

NAUTICAL GOSSIP AT HOME AND ABROAD.

ROTTERDAM is, owing to the new outlet to the German Ocean, claimed to be the most accessible port on the continent, and one of the cheapest. The waterway to the Hook of Holland is, moreover, stated to be rapidly improving in depth, and soon the largest ocean vessels will be able to reach Rotterdam without the least trouble. Since 1875, the improvement has been very marked, the depth of the Hook then averaging only 43 decimetres in the navigable channel during high tide, while now it is 88 decimetres. £125,000 is to be spent in the present year, 1890, on the waterway to still further improve it.

MR. G. DIRKZWAGER, of Rotterdam and Maaslius, has issued the sixteenth edition of his useful "Guide," which contains a number of well-drawn charts as well as information that traders and mariners using this waterway may require. And as it is in English, may be expected to be largely utilized by masters of British vessels frequenting the port.

THE first light on the system of Captain Paul la Cour's "spectro telegraph" system adopted for harbour purposes is to be seen at Aarhus, Jutland. The new lantern at Aarhus, when seen from the sea, is red, green, blue or violet, according to the different directions in which it is observed. In the entrance line to the harbour the colour is red; when going away from this line, to one side, the

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light alters with steady changes. The same system of colours is repeated in the same order at certain distances when one continues to move away.

These colours are said to be easy to go by, when it is remembered that the red colours are nearest the entrance line, the bluish farthest away from it, and that they are separated by white. The intermediate colour between two sections of colour is peculiar, but for harbour lights, the "La Cour" system is said to be efficient.

Germany leads the way with floating exhibitions, and now Spain has followed suit. The steamer *Conde de Vilana* has been fitted up as an exhibition of Spanish goods, and is making a tour of all the principal South American ports. Recently the vessels was at Buenos Ayres, and created considerable interest, 4,000 persons visiting it in one day, leading to increased demand for Spanish products and manufactures. Would it not be wise for British merchants and others to do likewise?

It is announced that the Board of Trade have determined to postpone till the 30th June next, the operation of the rules made under the provisions of the Merchant Shipping (Life-Saving Appliances) Act, 1888, which were to have come into force on the 30th March.

The report of the committee with the full text of the rules was given in the *Nautical* for August last. A very cursory inspection of the rules will show that while they will not require cargo vessels, either steam or sailing, to carry much more life-saving apparatus than they usually have had, the quantity will be materially increased in passenger vessels.

I notice for instance that passenger steamers plying on rivers or lakes, or going to sea for short excursions, will be required to carry so many life-belts or buoyant apparatus that they, together with the boats, shall be sufficient to keep afloat

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all persons on board. When it is remembered that such vessels usually carry very large numbers of deck passengers, it will be seen that to supply them with buoyant apparatus or life-belts, both as regards the quantity of apparatus and the place where it is stowed, is a matter of some consideration. The extension of time will enable excursion steamers to commence their season's running without all the new apparatus, and thus the providing of it can be spread over a longer period.

In connection with the further development of the dead-meat trade by sea, it is stated the London and Tilbury Lighterage Company have had a fleet of refrigerating barges built. The barges are roofed in and insulated in a similar manner to the cold chambers of sea-going steamers, and each barge will store and carry about 50 tons of meat. Ammonia is employed as the frigorific medium, and one barge of the fleet is appropriated to the apparatus for producing it, the barges containing the meat receiving their supply of cold brine through insulated flexible hoses which can be disconnected when required. The freezing machinery is designed to cool each barge to a temperature below 20° Fahr. in about an hour and a-half, and it is capable of cooling and maintaining at that temperature six barges, having a combined capacity of about 300 tons of meat. Cold brine is the medium used for keeping the chambers cool.

A remarkable petroleum accident happened in the Wear on the 8th January. The steamer, *Wild Flower*, which carries petroleum in bulk had been ashore, had come to Sunderland for repairs, and was being pumped out preparatory to being placed in dry dock. A quantity of oil appears to have been in the tanks and was pumped with the water into the river. It is supposed that this was set fire to by a hot rivet dropped into the river from a neighbouring ship-yard, and suddenly the river for about 200 yards became wrapped in flames, which rose to a considerable height and set fire to some vessels, which remained burning for about an hour, until the fires were extinguished by the police and others on board. Five vessels were damaged to the amount of

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some thousands of pounds, and of some men who leaped into the water from a steamer set on fire, one was drowned. A Board of Trade inquiry into the accident is to be held.

It is stated that the orders in hand for racing yachts are this winter much above the average, although prices are high. One vessel of considerable interest is a composite cutter of about 118 new rating or "sail-tons," being built by Messrs. Fay, of Southampton, to the order of Mr. John Jameson, of Dublin. She will be a centre-boarder, her length being 84 ft., and her beam about 3 ft. more than the beam associated in yachts of recent type with that length. Her centre-board will be 7 ft. deep, and her lead keel, which has a slot in it for the centre-board, will weigh 72 tons. Messrs. Fay have also a 40-rater in hand for Mr. A. D. Clarke; Messrs. Forrest and Sons, of Wyvenhoe, have also a 40-rater racing cutter, and another vessel of the same size is building at Eastbourne. No less than five 20-raters are building at various parts.

A despatch recently made public gives some interesting particulars of the progress of the colony of Hong Kong. The tonnage entering the harbour in 1888 was nearly 6½ millions, for the greater part of which it was the terminus, not a mere port of call for coaling purposes. The whole junk trade of 1,864,000 tons ends there, as do three lines of ocean steamers trading to America, two to Australia, one to Calcutta, two to Europe, and others to Siam, the Philippines, Borneo, and the coast ports of China. In quite recent years sugar refineries, ship and boat-building yards, rope works, &c., have been established.

TRITON.

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THE

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THE INTERNATIONAL MARINE CONFERENCE.

THE International Marine Conference met at Washington on the 17th October, 1889, and completed its deliberations on the 30th December. Admiral S. R. Franklin, of the U. S. Navy, presided, and the countries represented by delegates were Austria-Hungary, Belgium, Brazil, Chili, China, Costa-Rica, Denmark, France, Germany, Great Britain, Guatemala, Hawaii, Honduras, Italy, Japan, Mexico, Netherlands, Nicaragua, Norway, Portugal, Russia, Siam, Spain, Sweden, Turkey, Uruguay, Venezuela, and United States. A resolution was adopted on the first day of the Conference that each nation represented would be entitled to one vote, also that the proceedings would be in English or French. Mr. C. Hall, Q.C., the leading English delegate, also stated at that meeting that the British Government would not consider as binding any of the regulations or conclusions adopted by the Conference. It is desirable to remember this with regard to all the resolutions, many of which may, it is true, be legalised because of their reasonableness, but not merely because they have been formulated by a Conference in which the vote of the greatest maritime nation in the world only counted for the same as that of Siam or Uruguay.

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At the commencement of the Conference, the English delegates were instructed to discuss two divisions of the programme only, out of the twelve arranged for by the United States; but by subsequent instructions they went into the discussion of the other parts of the programme; the report of the debates and conclusions, however, show that the real work of the session was that concerning the first division, *i.e.*, marine signals at sea and the rule of the road, all but a very small part of the general debates in the Conference being on this question. The other divisions of the programme formed the subjects of consideration by special committees, whose reports were accepted and included in the general report of the Conference. In the following pages we have given a pretty full and complete abstract of the whole report of the Conference, but it is necessary to remember that really *Division* 1 is that which has been thoroughly threshed out, and that thus the anticipation of our own Government as to the possibilities of work during the time at the disposal of the Conference are borne out by actual fact.

Before proceeding to the main part of the question, the Conference report disposes of some proposals which were before it in the following resolution:—

"That in the opinion of the Conference it is inexpedient to adopt course-indicating signals in foggy or thick weather; inasmuch as, among the other strong reasons presented by the Sound-Signal Committee, if such signals were used in crowded waters, danger would result from the uncertainty and confusion produced by a multiplicity of signals, and from the false security that would be created in the minds of mariners, and if vessels were navigated in dependence on such signals, where neither could see the other, there would be danger that the officer in charge might read the signal incorrectly, or, if he read it correctly, would interpret it wrongly."

Coming now to the "Regulations for Preventing Collisions at Sea" proposed by the Conference, it may be remarked that generally the ubstance of the old rules, and in most cases the words, are retained. his will be seen, and we think the whole matter better understood by our readers, if, in place of reproducing the "Regulations"

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of the Conference, we state the points in which they differ from the Regulations with which every British sailor is familiar.

First, the preliminary Article is made somewhat more precise as follows :—

"These rules shall be followed by all vessels upon the high seas and in all waters connected therewith, navigable by sea-going vessels."

"In the following rules every steam-vessel which is under sail and not under steam is to be considered a sailing-vessel, and every vessel under steam, whether under sail or not, is to be considered a steam-vessel."

"The word *steam-vessel* shall include any vessel propelled by machinery."

"A vessel is *under way* within the meaning of these rules, when she is not at anchor, or made fast to the shore, or aground."

In the Rules Concerning Lights, &c., the first modification we notice is that, whereas the present British rules prescribe that *no other lights shall be carried*, the Conference has it *no other lights which may be mistaken for the prescribed lights shall be exhibited.* The masthead light of a steamer is subject to the same conditions as in the British rules, but it is provided that if the beam of the ship exceeds 40 ft. the masthead light need be no higher than 40 ft. There is also a provision that the vessel must, if without a foremast, still carry the masthead light at the fore-part of the vessel, and at its proper height. A new article admits of a second masthead light as follows :—"A steam-vessel, when under way, may carry an additional white light, similar in construction to the light mentioned in sub-division (*a*).* These two lights shall be so placed in line with the keel that one shall be at least 15 ft. higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance."

The regulations as to side lights are the same as those in force at present, except that the light is to be merely *unbroken* over an arc of 10 points in place of *uniform and unbroken.*

* That referring to the ordinary masthead light.

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The Article referring to lights used by towing-vessels is amplified as follows :—"A steam-vessel when towing another vessel shall, in addition to her side-lights, carry two bright white lights in a vertical line one over the other, not less than 6 ft. apart, and when towing more than one vessel, shall carry an additional bright white light 6 ft. above or below such lights, if the length of the tow measuring from the stern of the towing-vessel to the stern of the last vessel towed exceeds 600 feet. Each of these lights shall be of the same construction and character, and shall be carried in the same position as the white light mentioned in Article 2 (*a*), excepting the additional light, which may be carried at a height of not less than 14 ft. above the hull."

"Such steam-vessel may carry a small white light abaft the funnel or after-mast for the vessel towed to steer by, but such light shall not be visible forward of the beam."

The Article referring to lights of a vessel not under command is practically the same as in existing rules, except that the two red lights are not to be less than *six* feet instead of *three* feet apart, and the shapes to be carried by day the same increased distance. The shapes may also be carried "where they can be seen."

Vessels employed in laying or picking up telegraph cable carry lights by Conference rules practically the same as under British rules.

The provisions of the Conference rules for side-lights of sailing-ships and of small vessels during bad weather are practically the same as under the British rules, but there is a new Article regarding the lights of very small craft, as follows :—

"Steam-vessels of less than 40, and vessels under oars or sails, of less than 20 tons gross tonnage respectively, when under way, shall not be obliged to carry the lights mentioned in Article 2 (*a*), (*b*), and (*c*); but if they do not carry them, they shall be provided with the following lights :

"1. Steam-vessels of less than 40 tons shall carry :

"(*a.*) In the fore part of the vessel, or on or in front of the funnel, where it can best be seen, and at a height above the gunwale of not less than nine feet, a bright white light constructed and fixed as prescribed in Article 2 (*a*),

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and of such a character as to be visible at a distance of at least two miles.

"(*b*.) Green and red side-lights constructed and fixed as prescribed in Article 2 (*b*) and (*c*), and of such a character as to be visible at a distance of at least one mile, or a combined lantern showing a green light and a red light from right ahead to two points abaft the beam on their respective sides. Such lantern shall be carried not less than three feet below the white light.

"2. Small steamboats, such as are carried by sea-going vessels, may carry the white light at a less height than nine feet above the gunwale, but it shall be carried above the combined lantern mentioned in sub-division 1 (*b*).

"3. Vessels under oars or sails, of less than 20 tons, shall have ready at hand a lantern with a green glass on one side and a red glass on the other, which on the approach of or to other vessels, shall be exhibited in sufficient time to prevent collision, so that the green light shall not be seen on the port-side nor the red light on the starboard-side.

"The vessels referred to in this Article shall not be obliged to carry the lights prescribed by Article 4 (*a*),* and Article 11 †, last paragraph."

The lights carried by pilot-vessels are the same in the Conference rules as in British rules, but the following additional regulations are made in respect of them :—

"On the near approach of or to other vessels they shall have their side-lights lighted, ready for use, and shall flash or show them at short intervals, to indicate the direction in which they are heading, but the green light shall not be shown on the port-side, nor the red light on the starboard-side.

"A pilot-vessel of such a class as to be obliged to go alongside of a vessel to put a pilot on board, may show the white light instead of carrying it at the masthead, and may, instead of the coloured

* The lights prescribed for vessels not under command.

† The lights to be exhibited by a vessel aground.

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lights above-mentioned, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above."

The regulations as to fishing-vessels' lights are much amplified and altered in detail. They are as follows :—

"Art. 9. Fishing-vessels and fishing-boats when under way and when not required by this Article to carry or show the lights therein named, shall carry or show the lights prescribed for vessels of their tonnage under weigh.

"(*a.*) Vessels and boats when fishing with drift nets shall exhibit two white lights from any part of the vessel where they can best be seen. Such lights shall be placed so that the vertical distance between them shall be not less than six feet and not more than 10 feet, and so that the horizontal distance between them, measured in a line with the keel, shall not be less than five feet and not more than 10 feet. The lower of these two lights shall be the more forward, and both of them shall be of such a character as to show all round the horizon, and to be visible at a distance of not less than three miles.

"(*b.*) Vessels when engaged in trawling, by which is meant the dragging of an apparatus along the bottom of the sea—

"1. If steam-vessels, shall carry in the same position as the white light mentioned in Article 2* (*a*) a tricoloured lantern so constructed and fixed as to show a white light from right ahead to two points on each bow, and a green light and a red light over an arc of the horizon from two points on either bow to two points abaft the beam on the starboard and port-side respectively; and not less than six nor more than 12 feet below the tricoloured lantern, a white light in a lantern, so constructed as to show a clear, uniform and unbroken light all round the horizon :—

"2. If sailing-vessels, of seven tons gross tonnage and upwards, shall carry a white light in a lantern so constructed as

* The ordinary masthead light.

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to show a clear, uniform and unbroken light all round the horizon, and shall also be provided with a sufficient supply of red pyrotechnic lights, which shall each burn for at least 30 seconds, and shall be shown on the approach of or to other vessels in sufficient time to prevent collision.

"In the Mediterranean Sea, the vessels referred to in sub-division (*b*) 2, may use a flare-up light in lieu of a pyrotechnic light.

"All lights mentioned in sub-divisions *b* (1) and (2) shall be visible at a distance of at least two miles.

"3. If sailing-vessels, of less than seven tons gross tonnage, shall not be obliged to carry the white light mentioned in sub-division *b* (2) of this Article, but if they do not carry such light, they shall have at hand ready for use a lantern showing a bright white light, which shall, on the approach of or to other vessels, be exhibited where it can be seen in sufficient time to prevent collision; and they shall also show a red pyrotechnic light, as prescribed in sub-division *b* (2), or in lieu thereof a flare-up light.

"(*c.*) Vessels and boats when line-fishing with their lines out and attached to their lines, and when not at anchor or stationary, shall carry the same lights as vessels fishing with drift-nets.

"(*d.*) Fishing-vessels and fishing-boats may at any time use a flare-up light in addition to the lights which they are by this Article required to carry and show. All flare-up lights exhibited by a vessel when trawling or fishing with any kind of drag-net shall be shown at the after part of the vessel, excepting that, if the vessel is hanging by the stern to her fishing gear, they shall be exhibited from the bow.

"(*e.*) Every fishing-vessel and every boat when at anchor shall exhibit a white light visible all round the horizon at a distance of at least one mile.

"(*f.*) If a vessel or boat when fishing becomes stationary in consequence of her gear getting fast to a rock or other

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obstruction, she shall show the light and make the fog-signal prescribed for a vessel at anchor, respectively.

"(*g.*) In fog, mist, falling snow, or heavy rain-storms, drift-net vessels attached to their nets, and vessels when trawling, dredging, or fishing with any kind of drag-net, and vessels line-fishing with their lines out, shall, if of 20 tons gross tonnage or upwards, respectively, at intervals of not more than one minute, make a blast; if steam-vessels, with the whistle or siren, and if sailing-vessels, with the fog-horn, each blast, to be followed by ringing the bell.

"(*h.*) Sailing-vessels or boats fishing with nets or lines or trawls, when under way, shall in daytime indicate their occupation to an approaching vessel by displaying a basket or other efficient signal, where it can best be seen.

"The vessels referred to in this Article shall not be obliged to carry the lights prescribed by Article 4 (*a*),* and Article 11† last paragraph."

The regulation in the British rules with reference to a ship being overtaken by another is thus supplemented by the Conference:—

"The white light required to be shown by this Article may be fixed and carried in a lantern, but in such case the lantern shall be so constructed, fitted, and screened that it shall throw an unbroken light over an arc of the horizon of 12 points of the compass; viz., for six points from right aft on each side of the vessel, so as to be visible at a distance of at least one mile. Such light shall be carried as nearly as practicable on the same level as the side-lights."

For vessels at anchor in a fairway, the existing British rules prescribe the exhibition of a white light in a globular lantern where it can best be seen, but not more than 20 ft. above the deck. For this the Conference propose to substitute the following:—

"A vessel under 150 ft. in length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding 20 ft. above the hull, a white light in a lantern, so constructed as

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* Those prescribed for vessels not under command.

† The lights to be exhibited by a vessel aground.

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to show a clear, uniform, and unbroken light, visible all round the horizon at a distance of at least one mile.

"A vessel of 150 ft. or upwards in length, when at anchor, shall carry in the forward part of the vessel, at a height of not less than 20 and not exceeding 40 ft. above the hull, one such light, and at or near the stern of the vessel, and at such a height that it shall not be less than 15 ft. lower than the forward light, another such light.

"The length of a vessel shall be deemed to be the length appearing in her certificate of registry.

"A vessel aground in or near a fairway shall carry the above light or lights and the two red lights prescribed by Article 4 (*a*)."*

The following are additional Articles proposed by the Conference in connection with the rules as to the lights to be carried by ships :—

"Every vessel may, if necessary, in order to attract attention, in addition to the lights which she is by these rules required to carry, show a flare-up light or use any detonating signal that cannot be mistaken for a distress signal.

"Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional station and signal lights for two or more ships of war or for vessels sailing under convoy, or with the exhibition of recognition signals adopted by shipowners, which have been authorised by their respective Governments and duly registered and published.

"A steam-vessel, proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can best be seen, one black ball or shape, 2 ft. in diameter."

The regulations as to Sound Signals for Fog, &c., are much more elaborate than those in the existing British rules. In order to show this we give them in full, the new Articles being shown in italics :—

"All signals prescribed by this Article for vessels under way shall be given :—

"1. By 'STEAM-VESSELS,' on the whistle or siren.

* For a vessel not under command.

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"2. By 'SAILING-VESSELS,' and vessels towed on the fog-horn.

"*The words* 'PROLONGED BLAST' *used in this Article, shall mean a blast of from* 4 *to* 6 *seconds' duration.*

"A steam-vessel shall be provided with an efficient whistle or siren, sounded by steam or some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient fog-horn, to be sounded by mechanical means, and also with an efficient bell.* A sailing-vessel of 20 tons gross tonnage or upwards shall be provided with a similar fog-horn and bell.

"In fog, mist, falling snow, *or heavy rain storms*, whether by day or night, the signals described in this Article shall be used as follows, viz :—

"(*a.*) A steam-vessel having way upon her shall sound at intervals of not more than two minutes, a prolonged blast.

"(*b.*) *A steam-vessel under way, but stopped and having no way upon her, shall sound, at intervals of not more than two minutes, two prolonged blasts, with an interval of about one second between them.*

"(*c.*) A sailing-vessel under way shall sound, at intervals of not more than one † minute, when on the starboard tack one blast, when on the port tack two blasts in succession, and when with the wind abaft the beam three blasts in succession.

"(*d.*) A vessel when at anchor shall, at intervals of not more than one ‡ minute, ring the bell rapidly for about five seconds.

"(*e.*) *A vessel, at anchor at sea, when not in ordinary anchorage ground, and when in such a position as to be an obstruction to vessels under way, shall sound, if a steam-vessel, at intervals of not more than two minutes,*

* NOTE.—In all cases where the rules require a bell to be used, a drum may be substituted on board Turkish vessels, or a gong where such articles are used on board small sea-going vessels.

† Two minutes in present rules.

‡ Two minutes in present rules.

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two prolonged blasts with her whistle or siren, followed by ringing her bell; or if a sailing-vessel, at intervals of not more than one minute two blasts with her fog-horn, followed by ringing her bell.

"(*f.*) *A vessel when towing, shall, instead of the signals prescribed in sub-divisions* (*a*) *and* (*c*) *of this Article, at intervals of not more than two minutes, sound three blasts in succession, viz.: one prolonged blast followed by two short blasts. A vessel towed may give this signal, and she shall not give any other.*

"(*g.*) *A steam-vessel wishing to indicate to another,* "*The way is off my vessel, you may feel your way past me,*" *may sound three blasts in succession, viz.: short, long, short, with intervals of about one second between them.*

"(*h.*) *A vessel employed in laying or in picking up a telegraph cable shall, on hearing the fog-signal of an approaching vessel, sound in answer three prolonged blasts in succession.*

"(*i.*) *A sailing-ship under way, which is unable to get out of the way of an approaching vessel through being not under command, or unable to manœuvre as required by these rules, shall, on hearing the fog-signal of an approaching vessel, sound in answer four short blasts in succession.*

"*Sailing-vessels and boats of less than* 20 *tons gross tonnage, shall not be obliged to give the above-mentioned signals, but if they do not, they shall make some other efficient sound signal at intervals of not more than one minute.*

"Every vessel shall in a fog, mist, falling snow, *or heavy rain-storms* go at a moderate speed, *having careful regard to the existing circumstances and conditions.*

"*A steam-vessel hearing, apparently forward of her beam, the fog-signal of a vessel, the position of which is not ascertained, shall, so far as the circumstances of the case admit, stop her engines, and then navigate with caution until danger of collision is over.*"

It thus appears that the modifications made in the rules as to provision of lights apply mostly to the lights of small vessels, while there are considerable additions as regards sound-signals.

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We now come to the matter upon which there has been so much discussion of late in this country, the "Steering and Sailing Rules," and here we find the alterations proposed are very small indeed. Prefixed to the Articles on this subject is the following note:—

"Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist."

The rules as to ships meeting, &c., are all the same as in existing rules until we come to the following, the text given being that of the old rules with the part omitted placed in parentheses, and the new part shown in italics:—

"Every steam-ship (when approaching another ship so as to involve risk of collision) *which is directed by these rules to keep out of the way of another vessel shall, on approaching her*, slacken her speed or stop and reverse if necessary."

The Article of existing rules allowing a steam-vessel, by blasts from her steam-whistle, to indicate to another in sight, a course taken as authorised or required by the rules, is by the existing rules optional; the Conference propose to make it compulsory.

The Article of existing rules prescribing that a vessel overtaking another shall keep out of the way of the overtaken vessel is supplemented by the following addition:—

"Every vessel coming up with another vessel from any direction more than two points abaft her beam, *i.e.*, in such a position with reference to the vessel which she is overtaking that at night she would be unable to see either of that vessel's side lights shall be deemed to be an overtaking vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

"As by day the overtaking vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel, she should, if in doubt, assume that she is an overtaking vessel and keep out of the way."

The Article of the existing rules:—"Where by the above rules

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one of two ships is to keep out of the way, the other shall keep her course," has the words *and speed* added to it by the Conference.

The Conference have added one additional Article as follows :—

"Sailing-vessels under way shall keep out of the way of sailing-vessels or boats fishing with nets or lines or trawls. This rule shall not give to any vessel or boat engaged in fishing the right of obstructing a fairway used by vessels other than fishing-vessels or boats.

The Distress Signals proposed by the Conference are as follows, the new matter being in italics :—

"Either together or separately in the daytime—

"1. A gun fired at intervals of about a minute.

"2. The International Code Signal of Distress indicated by N. C.

"3. The distant signal, consisting of a square flag, having either above or below it a ball or anything resembling a ball.

"4. *Rockets or shells as prescribed below for use at night.*

"5. *A continuous sounding with any fog-signal apparatus.*

"At night—

"1. A gun fired at intervals of about a minute.

"2. Flames on the vessel (as from a burning tar-barrel, oil-barrel, &c.).

"3. Rockets or shells, *bursting in the air with a loud report and* throwing stars of any colour or description, fired one at a time at short intervals.

"4. *A continuous sounding with any fog-signal apparatus.*"

We subjoin to this branch of the subject :—

APPENDIX B.

"The following Resolutions have been approved of by the Conference and are recommended to the attention of the Powers represented thereat :

"1. The power of all lights should be expressed by referring them all to one standard, by which the light issuing from the lantern should be measured.

"2. The minimum power only of each light should be definitely fixed, leaving it to the judgment of the parties responsible for

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fitting out the vessel with proper lanterns to employ lamps of this or greater power.

"3. The use of incandescent lamps should be permitted; the use of arc lights at present should be excluded for all purposes other than signalling and searching.

"4. Each lantern should be so constructed that the minimum power of light can be found at every point where the light is to be visible, after the lamp has been fitted with proper screens.

"5. The lanterns should be so constructed as to insure the light having at least the required minimum power in the ideal line connecting the lantern with the horizon, even though the vessel be heeled one way or the other 10 degrees.

"6. The colour of the glasses by which the colouring of the light is to be produced should be so chosen that, if possible, the red light shall have no admixture of green, nor the green light of red rays, and that both colours can be readily and unmistakably distinguished.

"7. No detailed description should be internationally adopted for the construction of the lamp or lantern, so that a fair chance may be given to inventors to produce serviceable articles.

"8. The side-lights should be so screened as to prevent the most convergent rays of the lights being seen across the bows more than half a point.

"9. The side-lights should be placed in steam-vessels not forward of the masthead light.

"10. To meet the number of complaints as to the absence of proper lights on sailing-vessels, the attention of the Powers is called to the better enforcement of the regulations in that behalf.

"11. All steam-whistles, sirens, fog-horns, and bells, should be thoroughly tested as to their efficiency, and should be capable of being heard at a stated minimum distance, and should be so regulated that the tones of whistles and sirens should be as distinct as possible from the sound of fog-horns.

"12. Steam-vessels should be provided, if possible, with means of blowing off surplus steam when the engines are stopped, in such a manner as to occasion as little noise as possible.

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"13. In clear weather at sea no vessel should attempt to cross the bows of the leaders of any squadron of three or more ships of war in regular formation, nor unnecessarily to pass through the lines of such squadron.

"14. In every case of collision between two vessels it should be the duty of the master or person in charge of each vessel, if and so far as he can do so without serious danger to his own vessel, crew, and passengers (if any), to stay by the other vessel until he has ascertained that she has no need of further assistance, and to render to the other vessel, her master, crew, and passengers (if any), such assistance as may be practicable and as may be necessary in order to save them from any danger caused by the collision, and also to give to the master or person in charge of the other vessel the name of his own vessel and her port of registry, or the port or place to which she belongs, and also the name of the ports and places from which, and to which, she is bound."

Division 2 of the programme related to "Regulations to determine the seaworthiness of vessels," and was sub-divided as follows:—

"(*a.*) Construction of vessels.

"(*b.*) Equipment of vessels.

"(*c.*) Discipline of crew.

"(*d.*) Sufficiency of crew.

"(*e.*) Inspection of vessels.

"(*f.*) Uniform certificates of inspection."

The conclusions of the Conference on this division are expressed in the first words of their report thereon as follows:—"It is the opinion of the Conference that upon the subjects contained in the sections of this division, no international rule could be made which would secure beneficial results." Reasons for this conclusion are found in the fact that if a minimum standard of efficiency were fixed it might have an injurious effect upon the existing practice in some countries, that this was a matter in which each nation could best proceed in its own way, and that to attempt to formulate detailed rules for the construction of ships would far exceed the province of the Conference. The only resolution agreed to upon the subject going into any practical detail was the last, *i.e.*:—"Ocean-going steam-vessels which carry passengers should be

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additionally protected by having efficient bulkheads, so spaced that when any two compartments be filled with water, the vessels will still remain in a seaworthy condition, and two at least of the amidships bulkheads should be tested by water pressure to the height of the deck next above the water-line."

Division 3 related to the "Draft to which vessels should be restricted when loaded," and was dealt with very summarily as follows:—"The Conference are led to believe that notwithstanding the advantages which would be connected with the introduction of a uniform system of load marks, this matter is not ripe for consideration by this Conference, and that it ought to be left to the negotiations to be carried on between the Governments of the maritime nations."

Division 4 dealt with "Uniform regulations regarding the designating and marking of vessels," the subject being divided as follows:—

(*a.*) Position of name on vessels.

(*b.*) Position of name of port of registry on vessels.

(*c.*) Size of lettering.

(*d.*) Uniform system of draft marks.

As regards the three first the resolutions of the Conference endorsed the existing legal regulations for British vessels. They also embodied in their resolution with regard to (*d*) the British rule upon the subject but admit as an alternative to English feet the marking of the draft upon the stern and stern-post in decimetres.

Division 5 deals with the question of "Saving life and property from shipwreck," sub-divided as follows:—

(1.) Saving of life and property from shipwreck at sea.

(*a.*) Duties of vessels after collision.

(*b.*) Apparatus for life-saving to be carried on board ship. (Life-boats, life-preservers, life-rafts, pumps, and fire-extinguishing apparatus.)

(*c.*) The use of oil and the necessary apparatus for its use.

(*d.*) Uniform inspections as to (*b*) and (*c*).

(2.) Saving of life and property from shipwreck by operations from shore.

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(*a.*) Organisation of, and methods employed by, life-saving institutions.

(*b.*) The employment of drilled and disciplined crews at life-saving stations.

(*c.*) The maintenance of a patrol upon dangerous coasts by night and during thick weather by day, for warning off vessels standing into danger, and for the early discovery of wrecks.

(*d.*) Uniform means of transmitting information between stranded vessels and the shore.

(*e.*) Life-boats, life-saving apparatus and appliances.

(3.) Official enquiries in causes and circumstances of shipwrecks and other casualties.

On these subjects the Conference passed a number of resolutions which we thus summarise:—In any case of collision it shall be the duty of the master of each vessel to stand by the other to see if she needs assistance, and to render it so far as he can do so without danger to his own vessel and those on board; and also to communicate to the other vessel the name and port of registry of his own vessel, and also the names of the places from which and to which she is bound. The Conference approved of the principle of the rules recently made by the British Board of Trade relating to boats and appliances to be carried on board ship for saving life,* and urge their general adoption for vessels of over 150 tons gross, at the same time recommending their application to smaller craft as far as is practicable, especially that each vessel of the latter craft should carry one life-buoy, and for every person on board an efficient life-jacket. They further recommended that sea-going vessels be required to carry animal or vegetable oil, with suitable apparatus for the purpose of calming the sea in rough weather.

On the question of saving life from wrecked vessels, the Conference recommend the preparation of uniform instructions to mariners with reference to their co-operation with a rescue-party on shore, to include the following signals, which we quote:—

Upon the discovery of a wreck by night the life-saving force will burn a red pyrotechnic light or a red rocket to signify—"*You are seen; assistance will be given as soon as possible.*"

* These rules are given in detail in *Nautical Magazine*, August, 1889.

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A red flag waved on shore by day, or a red light, red rocket, or red Roman candle displayed by night, will signify—"Haul away."

A white flag waved on shore by day, or a white light slowly swung back and forth, or a white rocket or white Roman candle fired by night will signify—"Slack away."

Two flags, a white and a red, waved at the same time on shore by day, or two lights, a white and red, slowly swung at the same time, or a blue pyrotechnic light burned by night, will signify—"Do not attempt to land in your own boats; it is impossible."

A man on shore beckoning by day, or two torches burning near together by night, will signify—"This is the best place to land."

Any of these signals may be answered from the vessels as follows:—In the daytime, by waving a flag, a handkerchief, a hat, or even the hand; at night—by firing a rocket, a blue light, or a gun, or by showing a light over the ship's gunwale for a short time and then concealing it.

The Conference did not see its way to recommend a uniform system of inspection of life-saving appliances. They resolved to recommend the various nations to provide by legislation for official enquiry in case of shipwreck and other serious casualties happening to vessels. Regarding the organisation of life-boat and other life-saving services on shore, they did not think it desirable to make detailed recommendations, since local circumstances must so much affect the question. They, however, recommended the establishment, where practicable, of a watch or patrol on dangerous coasts for the early discovery of wrecks and also to warn off vessels that may be incautiously running into danger.

Division 6 refers to "Necessary qualifications for officers and seamen, including tests for sight and colour-blindness," and is sub-divided as follows:—

(*a.*) A uniform system of examination for the different grades.

(*b.*) Uniform tests for visional power and colour-blindness.

(*c.*) General knowledge of methods employed at life-saving stations.

(*d.*) Uniform certificates of qualification.

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In this section the Conference wisely confined their attention to one important branch of the question as may be seen by the following rules formulated:—

"1. Every man or boy going to sea as a seaman, or with the intention of becoming a seaman, should be examined for visual power and colour-blindness; and no man or boy should be permitted to serve on board any vessel in the capacity of seaman, or where he will have to stand look-out whose visual power is below one-half normal, or who is red and green colour-blind.

"2. Every man who shall qualify as an officer or as a pilot of a registered vessel after the adoption of these rules, except engineer officers, shall be required to have a certificate that he has the necessary visual power, and that he is not red and green colour-blind. He shall also have a certificate that he is familiar with the regulations for preventing collisions at sea, and with the duties required of him in co-operating with a Life-Saving Station in case his vessel is stranded.

"3. It is recommended that each country provide means which will enable any boy or man intending to go to sea, to have his eyes examined for visual power and colour-blindness, and to obtain a certificate of the result; also, to enable the master of any vessel to have the eyes of his crew tested for the same purpose."

Adverting to the danger caused by defective visual power and also of colour-blindness as incapacitating a man from distinguishing between the red and green side-lights, the report calls attention to a possible cause of accident through inability on the part of a look-out to distinguish the colour of buoys by day. They refrain from recommending any details as to the conduct of examinations either as to sight or other qualifications.

Division 7 related to the much discussed subjects of "Lanes for steamers on frequented routes."

(*a.*) With regard to the avoidance of steamer collisions.

(*b.*) With regard to the safety of fishermen.

On these questions the Conference came to the wise conclusion that nothing could be done at present.

Selecting the North Atlantic as the route in which regulations were most desirable if practicable anywhere, they remark that

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although it would be desirable for ocean steamers to follow a southern route during the spring and summer months, keeping clear of the Banks of Newfoundland and of fog and ice, yet it would be difficult to prescribe any figures as to latitude. For one thing, by so doing, the ports of one country might be favoured at the expense of another. Again, it is well known how difficult it is to enforce the rule for moderate speed in foggy weather. Would it not be still more difficult to enforce a *route* rule? From these and other considerations the Conference go no farther than to recommend the leading companies to consider the question and try to arrange a system of routes which should then be published for the information of navigators. They further remark that collisions do not occur so often in the open sea as near the coasts, where all routes would converge. The safety of fishermen on the banks would be best promoted by greater vigilance on their part, and by careful compliance with the present rules for the prevention of collisions, especially as to the efficiency of lights and sound signals.

Division 8 deals with "Night-signals for communicating information at sea," sub-divided as follows:—

(*a.*) A code to be used in connection with the International Code Signal Book.

(*b.*) Or a supplementary code of limited scope to convey information of special importance to passing vessels.

(*c.*) Distress signals.

In this question, the Conference expressed an opinion against the use of coloured lights for night-signals, on the ground of the limited distance at which they can be seen, and against pyrotechnic lights on the ground of cost. Having before them "A supplementary code of limited scope to convey information of special importance to passing vessels," prepared by the British Board of Trade, they approved it with one alteration. They further decided upon two fog-signals, first for vessels requiring pilots—a prolonged blast followed by a short blast; second, for pilots offering service—a short blast followed by a long blast; recommending that they be inserted in the International Code Book and also recommending that the complete alphabet of the Morse Code be inserted in the International Code Book for optional use.

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Division 9 deals with Warnings of Approaching Storms and includes :—

(*a.*) The transmission of warnings.

(*b.*) The uniformity of signals employed.

The subjects of this division were practically ruled to be beyond the scope of the Conference, since from the nature of the subject they would best be dealt with locally ; but a desire was expressed that the subject of a uniform system of indicating storm warnings might be considered in the future.

Division 10 included "Reporting, marking and removing dangerous wrecks or obstructions to navigation," and was sub-divided :—

"(*a.*) A uniform method of reporting and marking dangerous wrecks and derelicts.

"(*b.*) The division of the labour, cost and responsibility among the several maritime nations, either by geographical apportionment or otherwise.

"Of the removal of dangerous derelicts ;

"And of searching for doubtful dangers with a view of removing them from the charts."

In respect of this division the Conference submits a number of resolutions for the consideration of the Powers.

The first proposes to make it compulsory on any of the officers or crew of a derelict as soon after landing as possible to report to the nearest harbour authority, through their consul if necessary, with reference to the vessel abandoned ; information of her name, number, port, where from and to, and general description, also stating where abandoned, and whether it is intended to attempt her recovery, and, if a derelict, her probable present position.

A master of a vessel sighting a derelict should also be required to give information thereof, and make an entry in his log. All such reports should be utilised by being made public in the most suitable manner. Similar duties should be imposed upon shipmasters seeing icebergs or dangerous field ice, or a shoal or reef, and in the latter case the position should be determined and reported.

They also recommend that a crew leaving a derelict should be bound, if practicable, to hoist a distinctive signal on her plainly

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indicating the fact, and to let go the sheets and halyards of such sails as are not furled. The maritime powers interested in the navigation of the North Atlantic westward of a line drawn from the Bermudas to Cape Race, Newfoundland, are by a resolution of the Conference asked to make an agreement respecting removal of derelicts. Finally, it is recommended that consuls be instructed to consent to the destruction of dangerous wrecks which are not cleared in reasonable time by those interested therein.

Division 11 deals with the question of "Notice of Dangers to Navigation, and of changes in Lights, Buoys, and other Day and Night Marks," classified thus:—

"(*a*.) A uniform method of taking bearings, of designating them (whether true or magnetic) and of reporting them.

"(*b*.) A uniform method of reporting, indicating, and exchanging information by the several maritime nations—to include the form of notices to mariners.

"(*c*) A uniform method of distributing this information."

On this question the Conference took the course of recommending the several maritime powers to consider with a view to establishing uniformity in the subjects treated of in "Notice to Mariners" and "Light Lists" some resolutions, which we give in full, as follows:—

"1. That all bearings be given from seaward.

"2. That the bearings of cuts of different coloured sectors of lights or bearings of lights defining a narrow channel should be expressed in degrees where practicable.

"3. That all bearings expressed in degrees should count from North and South, from 0° to 90°, towards East and West.

"4. That in designating bearings, the letter E. shall designate East, and the letter W. shall designate West.

"5. That whenever bearings are given, the variation of the compass at the place should be stated.

"6. That distances should be expressed in nautical miles and fractions thereof. The word 'cable' should mean the tenth part of a nautical mile.

"7. That whenever the longitude of a position is given, it should be stated which prime meridian is adopted, and if other than that

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of Greenwich or Paris, the difference of longitude should also be stated.

"8. That in defining the visibility of a light, it should be stated whether the distance is for 'clear' or 'mean' state of the weather.

"9. That where the geographical range of a light is given, it should be calculated as seen at high water from an observer 15 feet or 5 metres above the sea.

"10. That a uniform classification of lights based on luminous intensity and on the character as seen by the mariner, should be adopted.

"11. That the central offices that issue 'Notices to Mariners' or 'Light Lists' should be permitted to correspond direct on such subjects.

"12. That from countries where 'Notices to Mariners' are published only in newspapers, copies of such papers should be sent to the various hydrographic offices."

Division 12 is concerned with the question of "A Uniform System of Buoys and Beacons." The Conference in this matter was impressed with the desirability of such a system, and put forward one tentatively "as an example showing that uniformity is attainable if the countries interested will agree to consider the subject." As the proposals are put forward rather to invite further consideration of the subject than with a view to their being adopted, we shall not take up space by describing them.

On *Division* 13, dealing with the proposal to establish "a permanent International Maritime Commission," the Conference passed a resolution declaring that for the present it is considered inexpedient.

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THE MARINER'S COMPASS: ITS HISTORY AND DEVELOPMENT.

(*Continued from Magazine for* 1889, *p.*, 1014.)

PATENTS and specifications for improvements in connection with the mariner's compass extend back for 120 years or more; but in the large majority of instances the conceptions of the inventors in this field have been utterly valueless, many being mechanically wrong, and not a few being absolutely absurd, inasmuch as it was deemed possible to protect the compass from the action of the ship's iron, without, at the same time, intercepting the action of the earth's magnetic force on the needle. In some rare instances, however, it must be admitted that there have been improvements, more especially as indicated in some of the patent specifications brought forward within the last 20 or 25 years, but these more immediately relate to the card and needles, the compass bowl, and the design of the binnacle.

Taking the patents, however, *en masse*, and carefully classifying the similar designs of the different inventors, the whole may be ranged under one or other of the following heads :—

(1.) Mechanical arrangements applicable to the compass bowl, or the binnacle, to prevent undue oscillation in the card, or friction on the pivot.

(2.) Self-acting apparatus for registering the ship's course by compass.

(3.) Special arrangements of cards for visibility at elevated positions, and for adjustments to correct the deviations caused by the ship's iron.

(4.) Arrangements of auxiliary needles to detect or register the deviation.

(5.) Arrangements of magnets outside the compass, on the level of the card, and pointing to it, to isolate the needle, or intercept the action of neighbouring iron.

(6.) Arrangements of magnets on the compass-card to cause it to point at all times, and in all places, to the true north.

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(7.) An arrangement of metals, or some presumed non-conducting substance, surrounding the compass, to prevent or cut off *local attraction.*

(8.) Methods of depolarizing, or demagnetizing an iron ship's hull, in order to prevent the deviation of the compass.

(9.) Methods for polarizing such parts of the iron ship as may be deemed requisite, to correct, or prevent, the deviation of the compass.

Turning from the impossible and improbable, a few of the designs may, with advantage, be specially noted:—

In a patent of 1809, Smith and Harris had a wire depending from the glass cover, to prevent the card being thrown off its centre in a heavy sea.

In 1810, Stebbing introduced a needle suspended on a ruby point and agate centre; the compass-fly was of silk impressed with the compass points, and attached to a light circular rim of brass, as was common in the ordinary azimuth compass. This arrangement was for lightness of card.

Dolland's compass, constructed to prevent excessive oscillation, had the usual gimballing suspension with the addition of a spiral spring to each axis, the card being suspended on a spiral spring acting within two cylinders.

In fact, in the early days, before the adjustment of compasses necessitated the use of two or more needles, the bent of the *best makers* lay chiefly in the direction of checking the inconvenient oscillation of the compass on board ship; while, at the same time, it must not be forgotten that there was a great and almost endless variety of forms and contrivances for the instrument as a course and bearing indicator. Here, however, may be mentioned the form of the mariner's compass generally known in the trade as the dipping needle—although in no sense a needle to indicate the dip or inclination: in this instrument two short bar magnets were used, each bar being hung on a transverse horizontal axis, applied to pivots fixed to slits in the compass card.

Subsequent to 1840—when iron had come to be recognised as an efficient material in the building of ships and steamers—and up to 1856, the ordinary size of the compass-card varied from six

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to seven inches in diameter; an eight-inch card would be considered as a large compass. But with increase in the size of the ships came in the idea of increase in the dimensions of the compass, which was a great mistake; or, if the cards were to be enlarged, there was absolutely no necessity for increasing the length of the needles, which, owing to the generally low binnacles at that date (rarely exceeding two feet in height) would be very detrimentally affected by the transverse iron beams.

Laurent's patent, dated 1867, related to "*a certain improvement in nautical compasses.*" The intent of the invention was to diminish or entirely obviate the oscillation of compasses and magnetic needles on board iron and other ships, and in high seas. The invention was applicable to compass-cards, to sets of magnetic needles, and to a single needle, used on board all kinds of vessels; equally applicable to all forms, sizes, and arrangements, as well as to all modes of suspension of compass-cards, or magnetic needles; it might also be applied to render magnetic needles or compass-cards more sensitive when sluggish.

To obtain the necessary stability the compass-card was to be weighted as far as possible from the point of suspension,—to obtain more sensitiveness the card was to be weighted as near the centre as possible; hence the weights, of whatever form, whether pieces of metal, or rings of metal, must be removable, as required.

Paget's patent, dated 1868, related to "*improvements in constructing ship's compasses and their binnacles, and in preventing the deviations of compasses in iron or steel ships.*" The improvements related to a novel mode of constructing steering or binnacle, standard or surveying, and masthead compasses, whether for sailing or steam-ships. From the small ratio of the mass and moment of inertia of the patentee's compass-card to its magnetic movement, and also from its low centre of gravity, it would be delicate enough to be used in the finest weather, while at the same time an identically similar card could be used in a storm, or at the masthead, or in a boat.

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The shortness of its needles would also bring it into favourable conditions in iron vessels as regards deviation.

Instead of using several needles arranged parallel to each other in one horizontal plane, two or more short thin magnets, about one and a-half or two inches long, and about one-sixteenth of an inch apart, were to be placed one above another in a vertical plane on supports of aluminium,—preferentially lozenge or rhomboidal-shaped needles contracting from the middle to the ends were used, but these did not preclude other shapes. When two such assemblages or columns of needles were used they would be placed in relation to the cap for the pivot so as to balance each other, and at such distance from the centre as to form two chords, each about 30° from the parallel diameter; when four such assemblages of needles were used, they would be placed two at 15° and two at 45° on each side of the parallel diameter.

An ordinary card of talc would be stiffened by a ring of aluminium, or ebonite if necessary, and aluminium would be used for all parts of the card and its fixings instead of brass or copper. If a card were made of a solid plate of aluminium, the metal should be stamped or corrugated out with raised designs representing the usual points of the compass.

It may be noted that Paget in his specification claims that his "improvements are applicable to all kinds and constructions of compasses," and he proceeds to indicate to what extent the adoption of his method would improve the various forms of compasses then in general use.

Sir William Thomson's patent, dated 1876, related to "*improvements in the mariner's compass, and in the means for ascertaining and correcting its errors.*"

"The objects of the invention are," so far as relates to the compass-card, with which alone we are at present dealing:—

"First. With smaller needles than in compasses hitherto in practical use to obtain as long a period of free oscillation, as is suitable for working well at sea.

"Second. Smallness of frictional error."

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And the specification then proceeds as follows:—

"Steadiness of the compass at sea in stormy weather has hitherto been attained by making the compass-card and needles large and heavy, and sometimes also by adding weights. The addition of weights is detrimental as increasing the frictional error, and tending thereby to make the compass follow the motion of the ship when she moves in azimuth. In a mathematical paper communicated to the British Association in 1874, and published in the *Philosophical Magazine* in November, 1874, I showed that the largeness of period obtained by great dimensions is favourable for steadiness. It follows from these considerations that it is desirable to obtain as large a moment of inertia as possible with as light compass-card, magnets, and frame as may be.

"The compass consists of a light aluminium boss with a central sapphire cap for the compass to rest on, and a rim of aluminium of from 4 to 9 inches diameter, according to the size of the compass. There is an even number of holes in the rim (to save circumlocution I shall call the number 32, being the number I prefer for my largest size of compass-card), and half that number in the circumference of the boss. The rim and boss are connected together by means of 16 fine silk threads forming, as it were, 32 spokes, and the compass-card is partly supported by these threads and partly by the rim. Two or four small magnets having their corresponding ends tied together by silk threads of equal lengths, so that the magnets may be as nearly parallel as possible, are attached to the rim by means of four silk threads. One of these threads is fastened to the centre of one extreme magnet, and the other two threads to the ends of the other extreme magnet. The other end of the first-mentioned thread is attached to the east or west point of the rim, and those of the remaining threads to two points at equal angular distance on each side of the opposite point. Two threads parallel to the north and south line are stretched between points on each side of the north and south points at such distances as just to pass clear of the boss. These threads are used to judge by the eye in adjusting the magnets to have their lengths parallel to the north and south line of the compass-card.

"The following method is used for giving an equal tension to

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each of the threads between the boss and the rim:—Each of the sixteen threads is passed through a hole in the circumference of the boss, and stretched thence into two slight notches in the top of the rim, then down and through two contiguous holes on the middle of the rim; one end of the thread is then knotted, and a weight attached to the other end. The rim is placed on a suitable circular stand, and the boss is worked about until the rim is made truly circular, and the sapphire cap is truly the centre. The ends of the threads with the weights attached are then cemented to the aluminium rim, the weights are cut off, and the ends are firmly secured by means of other holes in the aluminium rim. I thus obtain a compass which, whilst being extremely light, and yet having a large radius of gyration, has very small frictional error with small enough magnetic moment to give a very long period of free vibration."

Sir William Thomson's compass is no doubt thoroughly perfect in all its theoretical details, and is found to act with considerable precision at sea.

In closing the subject it may be well to define some of the terms in physics which appertain to the theory and development of efficient compass construction.

Inertia may be defined as the property of matter to move, or remain at rest, according as it is acted on by external forces, which it has no innate power to oppose; and the *moment of inertia* (I) is the sum of the products of each molecule of a rotating mass by the square of its distance from the axis of rotation.

In finding the moment of inertia of lines and planes they are supposed, as in finding their centre of gravity, to be made up of particles of matter uniformly diffused over them.

The *radius of gyration* (K) is the distance from the axis of that point where, if the whole mass (M) be collected, the moment of inertia is unaltered; thus—

$$M K^2 = I.$$

And for a circular area about a perpendicular line through its centre, where r is the radius—

$$I = M \frac{r^2}{2}.$$

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Otherwise the *centre of gyration*, in a circle revolving in its own plane, round its centre, where D = the distance of the centre of gyration from the axis—

$$D = \frac{r}{\sqrt{3}} = \frac{r}{1{\cdot}414}.$$

Also, the *centre of oscillation*, where D = the distance of the point of suspension from the centre of oscillation; in a circle vibrating edgeways—

$$D = \frac{3}{2}r.$$

The plane of a circle revolving about the diameter has its centre of gyration removed from the centre by one half of the radius.

The distance of the centre of gyration from the axis of motion is always a mean proportional between that of the centres of gravity and oscillation.

The *magnetic moment* is the product of the strength of either pole of a magnet by its length; thus, if m be the strength of the N-seeking pole of the magnet, and l be the length between the poles, then the magnetic moment $= m \times l$.

For the position of two magnets on the fly, discussed on the basis of three axes, one axis parallel with the magnet, another at right angles to the first, and a third the vertical axis, the two magnets should be fixed as a chord of the fly, about 30° from the diameter, and at the distance of half the radius below the fly.

We might, in a similar manner, deal with the *period* of the compass-card, and its vibrations in time; but all these things belong to the theory of the compass considered as an instrument of precision, which it never has been and never will be in the same sense as a reflecting instrument must, to be of any value, be an instrument of precision.

To the ordinary optician the theory of the compass is beyond his ken. It is sufficient for him if, by skill in the construction of the instrument, and carefully testing its action, he produces, by the judicious arrangement of the different parts, a compass suitable for use on board an iron ship, and which through lightness of the card, with the weight partially thrown on the rim, and the needles of *sufficient* power to bring the mass accurately to the magnetic

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meridian, the instrument is one of considerable stability and at the same time fully sensitive to the earth's directive force.

FUTURE NAVIGATION.

(*From a Foreign Contributor.*)

OUR time has brought forth so many great inventions, that things once looking utterly impossible, have become facts unawares. Thus we should hesitate to speak of future navigation, for what now would seem an ideal to us may then be a matter of passed by imperfection. Still we must think forward if we would improve upon anything, and especially so, if the present state of matters is not what it might be.

Let us first consider in what mode future navigation will be, because it must be carried on. The transportation of passengers, mails, and express freights will call for the fastest steamers. But there are quite a number of freights, for instance, coal, ores, lumber, grain, cotton, guano, &c., which will not bear costly shipping. For these we must provide slower vessels, carrying freights at a smaller cost, but still at a greater speed than our present sailing-vessels. This would seem to argue that sailing-vessels will have to disappear by-and-bye from the ocean; but I would assert, that they may maintain their place if speed be the leading object in their construction. What pitiful sailing-vessels are still afloat! built rather on the principle of a box, fair and square, but slow in sailing. Even those clippers rarely fill the bill.

Let us now consider the fastest steamers of the future. Of course, I cannot point out what improvements in steam generation, or its utilisation, or in other motive powers, will be made; the decreasing supply of coal will at the proper time, I hope, lead to the invention of, possibly, making water combustible, either by the separation of its elements and their subsequent recombination

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within the cylinders, or by the addition of some chemical. Electricity will do the former, but as yet with little advantage.

When the quick-firing repeating rifles called for smokeless powder—it was invented, and so may be invented some unthought of motor when there shall be an urgent need for it. Thus we can for the present only speak of the vessel itself and its propulsion by screws. The latter may still be improved in shape, but they can hardly be replaced by a better propeller.

There is no theoretical limit to the length of vessels; in fact, if we could build a vessel one mile long, and some 50 to 60 feet wide, giving her three screws at the stern and one pair of paddle-wheels for every 500 feet of her length, we would certainly attain an immense speed, because only the one-thirtieth part of her total length would have to overcome the inertia of the water ahead of the bow, whilst all the rest of the vessel would experience but surface friction. Thus the longer the vessel the better for speed and carrying capacity; but there is a practical limit to this rule, and this is, that no vessel can well be built longer than twelve times her width; in fact, this length is already an extreme in spite of all the bracing we may employ, for twelve widths mean at the same time about sixteen depths of hold, and this is drawing the whole into a dangerous, yielding, bending, vibrating, unsolid structure, exposed to enormous strains. Yet such vessels cross the ocean, and we shall not return to safer lengths until some of them break in two when they have reached the point that so many iron bridges have come to. I believe that ships nine widths or *twelve depths* of hold long will answer all that can be desired in regard to speed, safety and carrying capacity. Indeed, if we employ but screws and no additional paddle-wheels, the relation between active surface of screws to the immersed portion of the vessel will be more favourable in this case than in the larger vessels.

Extreme speed being the principal aim, the lightning express vessels of the future will all be fitted out with three screws; one at the ordinary place, and twin screws either before or behind the former, revolving in the opposite direction.

The rig of these vessels will depend upon the line they are running. Vessels plying in the higher latitudes will require small

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rig on account of the unsteady winds which help speed in as many cases as they retard it. It may, however, be of advantage to give liberal good rig to vessels of long course.

Next to these swift vessels there will be a need of slower freight vessels of first-class sailing qualities, fitted with one liftable screw, worked by an engine of the simplest construction. High and low-pressure cylinders may work upon one crank by one common piston rod.

These vessels will be rather sailing-vessels carrying an engine merely as an auxiliary, helping them to proceed on their way through calms, feeble, or contrary winds. I think an engine driving such a vessel at the rate of about six miles an hour, will prove the most economical.

They should never exceed six widths in length, because this will prove about the best for three-masted full-rigged vessels. It may be an empirical rule to reckon one full-rigged mast to every two widths of a vessel and a schooner mast to every single width, but it will hold good for the different lengths of vessels, since we have no other means to base it upon exact scientific principles. Thus we would have a schooner or schooner-brig rig to a vessel three widths long; a brig-rig to one four widths long; a bark-rig to one five widths long, and a full rig to one six widths long. This rule might be continued to four and five-masted vessels, but since these would get backed by the three-masted full-rig, sailing with rear winds, it stops short with the ordinary full-rig. The ordinary schooner-rig does not exactly fit into this rule, being a poor rig for sea-going vessels any way; but as it is a good rig for coasting vessels, requiring but few men, I ranged them with the schooner-brigs. The above rule refers only to the number and rig of the masts to the different lengths of the vessels so as to insure a certain limit to the action of wind upon the sails. If we would try, for instance, to put a full-rig upon a vessel five widths long, the full-rigged masts would crowd too much, they would also be smaller than the full-rigged masts of the bark-rig and they would give less speed with all the rear winds, as a matter of course. Putting in turn a bark-rig upon a vessel six widths long the square rigged masts would give good speed with the rear winds,

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but being of unproportionate size to the vessel they will stand less of the hard winds; the vessel will careen more with the side winds because of the higher lying centre of the force of the wind upon the sails, and in the course of a voyage she would certainly get backed by the full-rigged vessel of six widths. The total surface of the sails being equal in both cases.

By so reasoning, I come to the conclusion that a full-rigged vessel, six widths long, will be endowed with the best sailing qualities, excelling in speed all the other sorts of sailing-vessels. I adopted the above-mentioned rule only to find a definite relation between rig and length of vessel, and if we accept the full-rig as the best for speed, it follows that we must also accept the six widths for the length of such vessel and for sailing-vessels in general, because it seems evident to me that, instead of building a brig four widths long, it is by far more advantageous to build a *three*-masted schooner-bark of the same capacity, but *six widths* long. The longer vessel will pitch less and will also experience considerably less resistance in the water.

Although the last-mentioned compound vessels, being a mixture of steamer and sailing-vessel, will be the most appropriate for the purpose assigned to them, being also safer against shipwreck, there may still exist simple sailing-vessels of superior sailing qualities; for, while we must accept three-fourths of the width of all the screw vessels for their depth of hold, so as to insure a sufficient immersion of the screws with less than a full cargo, we may take two-thirds of the width of simple sailing-vessels for their depth of hold, so that they will immerse about five-twelfths of their width downward. Such sailing-vessels will have less carrying capacity than the compound vessel of the same length and width, but the stability being nearly equal in both cases, the sailing-vessel will stand the same rig, because she will also easier give way to the pressure upon the sails. Thus, if we wish to attain the utmost speed with sailing-vessels without regard to the carrying capacity, we must take to the last-mentioned relation between width and depth of hold. It is only by these means that sailing-vessels may maintain their place beside the screw-vessels.

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It would not do to lessen the depth of hold any further to increase the speed of sailing-vessels, because this would at once considerably impair the nautical qualities of the vessel and change the relation between length and depth of hold in a very unfavourable manner. If we allow twelve depths of hold for the length of a vessel, we might even go so far as to take one-half of the width of a vessel, six widths long, for her depth of hold. This may do for race boats, carrying a ballast of great specific gravity, but merchant vessels, laden with ordinary merchandise, would be very apt to capsize. But the speed of vessels depends also greatly upon their lines, which will be the subject of another article.

C. A. GAGSTATTER,

Pielachhof, near St. Poelten, Austria.

TRADE IN 1889.

THE Trade and Navigation accounts for last year, dated 3rd January, 1890, afford striking evidence of the "revival of trade" which has taken place.

1889.	Imports	£427,210,820
1888.	,, ...	386,582,023
	Increase	£40,628,797
1889.	Exports :—	
	British and Irish	£248,091,959
	Foreign and Colonial ...	64,989,775
		£313,081,734
1888.	Ditto	297,885,236
	Increase	£15,146,498
1889.	Total Imports and Exports ...	£740,242,554
	Increase	£55,775,295

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There were also quantities conveyed by parcel post not included in above. They were as follows :—

	1888.	1889.
Imports	£368,776 ...	£374,612
Exports	692,305 ...	886,938

The largest total ever reached before was in 1883, namely, 732 millions sterling. The excess of imports in 1889 was 36 per cent., but that was exceeded several times previously—the highest difference being in 1877 when it reached 56, exclusive of the bullion account.

The tonnage of cargo is as follows :—

1889.	Foreign trade.	
Inwards	£28.517,820	net register
Outwards	33,048,881	,,
Total	£61,566,701	,,
1888.	Foreign trade.	
Inwards	£27,077,182	,,
Outwards	31,664,440	,,
Total	£58,741,622	,,
Increase	£2,825,079	,,

The percentage increase of tonnage or weight is rather under five, that in value is eight, clearly showing that the prices *en bloc* have risen considerably.

The coasting tonnage account is as understated :—

1889.		
Inwards	£28,810,756	net register.
Outwards	27,502,997	,,
Total	£56,313,753	,,
1888.		
Inwards	£29,080,222	,,
Outwards	27,773,181	,,
Total	£56,853,403	,,
Decrease	£539,650	,,

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This account is for cargo only. The inference is that all available tonnage has gone into the foreign trade, and the railways and canals have benefited. It is a fact that the railway receipts have increased largely last year.

The increase in the exports, so far as weight is concerned, is mainly in coal. The increase therein is over two million tons, and that would just about absorb the 1·3 million tons net register, which is over that of the previous year. The large item of cotton (in value) is 58·8 millions sterling, against 60·3 of 1888. Woollens and worsted manufactures are as 21·3 millions sterling in 1889, against 19·9 in 1888. Total textiles 110·2, against 108·8 millions sterling in 1888. Total metals show an increase of 3·8 millions sterling, and machinery, 2·2 millions.

In imports there is an enormous advance in wood goods, as follows:—

	Loads.	Value.
1889	7,918,154 ...	19·2 millions sterling.
1888	6,507,825 ...	14·1 ,, ,,
Increase ...	1,410,329 ...	5·1 ,, ,,

It is mainly in sawn wood, which takes nearly a million loads of increase. This is probably owing to the immense turn-out of ships last year.

The import of iron has also gone up considerably. The amounts being as understated:—

1889	4,023,620 tons.
1888	3,552,408 ,,
Increase ...	471,212 ,,

Corn and flour imported have increased from 144 million cwts. in 1888, to 148 in 1889. The value remains stationary.

Petroleum has also expanded from 94 million gallons in 1888, to 102 in 1889.

Raw cotton has increased from 15·2 million cwts. in 1888, to 17·1 in 1889; but the value has fallen.

The total import of food and drink, which are duty free, have increased from 124 millions sterling in 1888, to 134 in 1889.

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The import of raw sugar remains about the same; but "refined" from Germany and France has increased about one million cwts. each, and about the same in value.

These are some of the leading features of an account which shows that our trade is in a healthy state at present.

There is ample employment for ships evidently; and the fact that prices are rising in a greater ratio than tonnage dissipates the theory that the depression in price, so long deplored, is entirely due to the depreciation of gold.

OIL AS A WAVE SMOOTHER.

THE extraordinary effects of oil as a wave smoothing medium requires no great amount of argument in its favour, for its "magical influence" in this direction has long been known to the intelligent seamen of all nations, and though seldom put into practice, here in these islands of the United Kingdom, or in any part of Europe, it has been believed in as thoroughly as it was in that old, old time when the divine writers of the East touched on its singular influence over troubled waters in their sacred songs. The general or public use of oil in subduing heavy breaking seas was first heard of by the present generation at Aberdeen, some twenty or five and twenty years ago, and its "magical effects" were witnessed by a great number of people during a heavy north-east gale. An official of the Board of Trade attended the trial, spoke of its "extraordinary calming properties," and published a short and very interesting pamphlet regarding it. If oil was never used for this purpose in the prehistoric days of the Vikings and the Arabs of the East, it was at least known to the Greek seamen in the days of Herodotus, and was used by those adventurous mariners in the open boats with which they navigated the Mediterranean sea at all seasons of the year and sailed out in the same tiny craft by the Pillars of Hercules into the more stormy Atlantic. And yet, with all its well-known calming influence, how seldom in these fast times have

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the seamen of Europe or America taken advantage of oil in any attempt to save themselves from shipwreck or their valuable vessels from the serious disasters which high-topping, fast-running, stern-splitting broken seas can effect.

Into the singular reason for this apparent indifference it is perhaps not necessary to look further back than the last fifty years; for previous to that period which saw the repeal of the Navigation Laws, and the general introduction of iron as a shipbuilding medium, the ocean-going ships of England and other nations always carried a high and defiant high side. Such vessels could well afford to laugh at all kinds of ordinary wind and weather, though, in truth, they came often enough to grief as they wandered aimlessly or blindly through the inextricable mazes of West Indian hurricanes or eastern cyclones, which, of course, were far from being in the least "ordinary" in their treatments of all classes of ships. The repeal by English statesmen of the world famous Navigation Laws opened the door to a hard, if not harassing competition, which at once set in not from the nations of Europe alone, but from the growing maritime power of the United States of America, which were just then appearing on the scene as foemen worthy of our gravest commercial apprehension. That competition not only lessened the handsome freights of British ships, but naturally brought about conditions which reduced their spare buoyancy, and ultimately, by the introduction of iron, increased their fore-and-aft dimensions to such an extent that they there and then ceased to ride over "troubled waters like things of life," but *per contra*, had their bulwarks washed by every high sea, and their expansive decks converted into wells of swirling water, which the said bulwarks were originally constructed to ward off. The birth of a new idea always takes more than a generation to effect, and the introduction of old methods no doubt labour under the same difficulties of time, but it now appears all but certain that in the very near future we shall have ocean-going ships carrying their supply of "hurricane-oil" as regularly as they have previously carried their allowances of salt beef. Already the powers that be have demanded its supply to the

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life-boats of British ships, and modern experience has proved that to its peculiar yet simple action in storms it has saved many vessels from foundering, and a still greater number from very serious damage to their equipment or to their cargo. In the September hurricane of last year, which ruthlessly swept the Atlantic of ships, no less than fifty-one vessels suffered either shipwreck or other serious disaster, and the very few which escaped that great storm's ravages were saved by their sagacious commanders flying to oil as their only earthly refuge. In the same way, during the more recent hurricanes of January of this year, the very few ships which escaped without serious injury, owe their good fortune in a great measure to the use of oil. What was ever done in this way when British trade was carried over sea in open boats will not be known till the minutest detail in the history of that open boat trade is written; but in later years oil was first used by some of the long-headed and enterprising people of Aberdeen as above stated. But the one difficulty which still faces the ingenious mariner preparing his oil bags for the coming storm, is how to apply those same bags in the most effective way.

This trouble has been appreciated by various clever people taking out patents wherewith to assist him. It is a very simple matter to get the oil to pass astern of any ship. One only has to make a short trip down the Channel to see how the greasy water from the cook's galley, during the process of "washing up," leaves a smooth and bright trail in the vessel's wake, and in the same way, when scudding before a heavy gale, a canvas bag of oil placed near each forward scupper-hole will give off its contents into the sea and thus take the biting edge off every following wave before it has time to reach the stern, and thus by bursting over the taffrail either sweep the after deck of every movable thing or at least strip the wheel of its many spokes and take circling tire and alarmed helmsman clean over the side, or else into the forward "knight-heads" in something less than the twinkling of an eye. In this evolution of scudding the application of oil is simple, but the difficulty of the position becomes apparent when scudding or running before the sea is no longer safe or practicable, and when heaving-to, with all its serious risks, has to be faced. For small,

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deeply-laden vessels, lying to under canvas, the risks are always serious — either to the masts or to the ship herself and her cargo. If this were not so how is anybody going to account for fifty-one ships coming to grief during one severe storm? Many foundered in that September hurricane, and perhaps about two-thirds of the number were either dismasted or had their decks swept, cattle washed overboard, and captains, officers and various members of the crew lost in the same way. In the storms during the fall of the year, in that quarter, there has always been a heavy amount of loss, but as cargoes increase generally in weight, and as the spare buoyancy becomes a diminishing quantity in consequence, their disasters will possibly increase, and some of the most intelligent seamen have met the difficulty by falling back now on oil as a handy and simple safeguard. Various devices have been patented here and in Germany for using oil *to windward*, for a ship when lying-to. Two German plans consist in having a gun which will throw an explosive shell charged with oil some distance in the wind's eye, but such systems, though they look well only on paper, are obviously impracticable in nearly all merchant ships. Another, patented in London, and which appears to be simple and effective, is to have oil-tubes attached to a sea-anchor or drogue. The apparatus, in principle, is a square-cut sail, floated by a yard, fitted with four guys—one at each corner—and this is veered ahead of the ship—after being made securely fast to the bows by about 60 fathoms of hawser. In this way it keeps the vessel's head to the sea, and the two oil-tubes, carrying from two to three gallons each, give off their oil in sufficiently small quantities to keep down the sea, and to last right through the length of any ordinary gale without further attention than fully charging them before putting overboard. This apparatus is eligible also for ship's life-boats, yachts, torpedo-boats, and other small craft. The inventor claims that when veered ahead of a boat, attached to 20 or 25 fathoms of painter, it works so effectually as to take the crest off the seas before they can reach her, and leaves nothing more dangerous for the boat to contend against than a high unruffled swell, which any boat will ride over, if managed with a fair amount of care. The havoc that was

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wrought during the late January gales, to ships and steamers on the Atlantic, was assuredly very serious, but it must be remembered that the powerful liners—some of which reported heavy damages—were possibly in very serious danger, further than what was evolved by the brains of some of their passengers who wrote to the newspapers their own individual and often very inaccurate opinions. These steamers invariably keep on their courses through the heaviest weather, and the loss of a few boats is of less importance to them than the loss of half a dozen days to their reputation as fast ships. The cargo steamers, many of which were in the same gales, suffered less, on the whole, than the liners, and this was probably due to the fact of their bending to the storm—which the liners refused to do—or giving way, either by running dead before the wind and sea, or "heaving-to," as is the common practice in all ships and steamers of their class when the waves run too high to make scudding practicable or safe. Of the small sailing-craft, which were totally lost during these storms—and indeed in such powerful ships as the *Shakespere*—it is probable that they would have done better riding to a storm anchor than in meeting the gale under canvas, for to make the sails "draw," they must necessarily lie at such a broad angle to the waves as to cause a great amount of incessant rolling and lurching, which not only strains old wooden ships to pieces, but is the chief cause of their losing masts, and ultimately sweeping their decks. A typical case was that of an American schooner. First, her sails blew away into ribbons, and before they could bend others her masts, having the rigging slackened and weakened by the terrific rolling motion, went by the board. The craft was then entirely helpless, and thus relieved of her steadying power aloft actually rolled herself to windward *under* the seas, which tore away her bulwarks, split her covering board, and finally completed her destruction by other smashings and by consequent leakage. Had this vessel used an oil-anchor ahead it is possible, and probable, that she would have ridden out the storm, for her position would have been head-on to the seas, and there would then have been no great side stress on her rigging, and little danger of her masts coming down, for all the heavy rolling and lurching which so effectually tries a ship's masts and strains

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every individual timber would have been reduced to a minimum, by the system of riding head to the gale. As the seas, under the influence of oil, do not break, it is reasonable to suppose she would not have lost her bulwarks. The only case where oil has no effect is upon the breaking waves of a sea beach, or upon a shoal or rocks—it only counteracts the effects of wind. E. B.

COAL SHIPMENTS, 1889.

THE deadweight of cargo cleared from the ports of the United Kingdom during 1889 was at least 90 million tons. That is to say, the register tonnage of cargo ships in the foreign trade was 33 millions, and that of the coasting section 27 millions. These vessels would carry at least 50 per cent. more than the net register tonnage. The coal ships took nearly half of this amount; and if "bunkers" be included, more than half. The paramount importance of the coal trade to shipowners is obvious. A short summary, therefore, of the business done last year will be of service. According to the *Trade and Navigation Returns* for December and the year, it appears that the total amount of all coal products exported to foreign countries and the Colonies was:—

In 1889...	28,974,129 tons.
,, 1888...	26,970,536 ,,
Increase	2,003,593 ,,

No port details are given therein; but in *Browne's Export List* we have the particulars of the quantities exported at the *majority* of the coal ports. Taking those only above half-a-million tons, they are as follows:—

Port.	(Coal only.) 1888.	1889.
Newcastle	4,374,884 ...	4,738,849 tons.
Blyth	826,384 ...	1,071,784 ,,
Sunderland	1,455,941 ...	1,608,057 ,,
West Hartlepool	536,601 ...	448,537 ,,
Hull	791,278 ...	939,097 ,,

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(Coal only.)

Port.	1888.	1889.
Grimsby	496,585 ...	555,906 tons.
Liverpool	551,763 ...	482,540 ,,
Cardiff	8,526,816 ...	9,000,543 ,,
Newport	2,241,180 ...	2,129,568 ,,
Swansea	896,849 ...	907,980 ,,
Glasgow	644,173 ...	655,625 ,,
Grangemouth	615,175 ..	767,458 ,,
Kirkcaldy...	990,436 ...	1,203,302 ,,

In the section of the foreign trade wherein "bunkering" forms a part, in the *Trade and Navigation Account*, the amount is as under :—

For 1889	7,736,794 tons.
,, 1888	7,121,393 ,,
Increase	615,401 ,,

There is no special list of ports published yearly. But for 1886 one was obtained, and an assessment for 1889, founded on the former year is as follows. It may be taken as substantially correct :—

Port	1886	1889 [estimated.]
Liverpool ...	1,793,000 ...	2,000,000 tons.
Cardiff ...	929,000 ...	1,150,000 ,,
London ...	799,000 ...	1,000,000 ,,
Newcastle ...	691,000 ...	750,000 ,,
Glasgow ...	485,000 ...	550,000 ,,
Newport ...	311,000 ...	350,000 ,,
Hull ...	230,000 ...	300,000 ,,
Swansea ...	166,000 ...	200,000 ,,
All other Ports ...	1,294,000 ...	1,336,000 ,,
Total ...	6,698,000 ...	7,736,000 ,,

In the coasting trade the amount of coal (exclusive of coke, &c.) given by *Browne's List* is 10·6 million tons in 1888 against 10·5 million tons in 1889. But this is only for the principal coal ports. The total for 1888 by the Government return was 14,007,423 tons for coal, and 14,237,553 tons for all coal products shipped. As

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the cargo tonnage is practically the same in the past two years for vessels cleared coastwise, it is fair to assume that the coal amounted to 14 million tons. Still, taking the limit of half a million tons, the leading ports stood thus as regards their several shipments :—

Port	1888.	1889.
Newcastle ...	3,292,582 ...	3,356,803 tons.
Sunderland ...	2,509,402 ..	2,245,955 ,,
Hartlepool ...	505,336 ...	464,938 ,,
Swansea ...	734,658 ...	715,919 ,,
Seaham ...	522,397 ...	478,644 ,,
Cardiff ...	1,179,411 ...	1,201,288 ,,
Newport ...	988,976 ...	923,133 ,,
Liverpool ...	801,379 ...	926,144 ,,

There is not much modification to notice in the relativity of the various coal ports as regards their shipments in the coasting trade. But, in the foreign-going business there is a considerable change going on. For instance, Blyth and Kirkcaldy—both insignificant places in other respects—have now each exceeded a limit of a million tons. In 1887, Blyth shipped only 509,281 tons ; and Kirkcaldy 750,990 tons. Both, during the short period of two years, have increased their export half-a-million tons. Since 1880 the increase, of course, is much more. There is no record for Kirkcaldy separately, but, in that year, Blyth shipped only 189,691 tons ; Grangemouth, 115,730 tons ; Cardiff, 4,897,440 tons ; Newport, 1,032,572 tons ; and Glasgow, 234,736 tons. All of these ports have increased enormously during the decade.

The amount of coal brought by sea to London last year was 4,767,876 tons. The principal ports which sent that tonnage were :—

Newcastle	2,515,692 tons.
Sunderland	1,021,864 ,,
Cardiff	309,516 ,,
Goole	201,274 ,,
Seaham	185,279 ,,
Hartlepool	177,279 ,,

All others were under 100,000 tons limit.

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The total by railway and inland navigation was 7,882,850 tons, showing an increase on the grand total of 131,379 tons. This is under one per cent.—the smallest percentage increase for many years—probably owing to the anticipated abolition of the London City dues in July last, and the great dock strike keeping the stocks at a minimum.

THE USE OF HYDRAULIC POWER IN STEAMSHIPS.

IT may appear to be a matter of surprise, that it should be found to be advantageous in vessels propelled by steam to adopt hydraulic power for subsidiary purposes. Probably such a feeling is one of the main factors why hydraulic power has not been more generally adopted. Certainly the idea is no new one, as thirty-six years ago several screw colliers were fitted with hydraulic appliances for discharging cargo. More recently hydraulic power was utilised in engine rooms for starting and reversing the main engines as well as for actuating steering-gears; but it was not until the year 1880 a steamer had what may be called a complete hydraulic installation. This was the British India Steam Navigation Company's steamer *Quetta*, and in this vessel the hydraulic machinery was fitted for steering, heaving the anchor, warping by capstans fore-and-aft, taking in and discharging cargo, lowering the derricks to clear cargo over the side, hoisting ashes, reversing main engines, and shutting the tunnel water-tight door in the engine room.

Foremost amongst hydraulic engineers to design machinery suitable for use on board steamships have been Messrs. Brown Bros. & Co., of Edinburgh. They were entrusted with the fitting up of the *Quetta*, and have since similarly supplied many other steamers of the same line as well as other companies' vessels. From time to time experience has suggested minor improvements, and it will be remembered by those of our readers who visited the Glasgow Exhibition in 1888, that on the

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maker's stand was exhibited an improved hydraulic ash hoisting arrangement.

Although there is somewhat increased capital outlay in hydraulic installations, yet the advantages in distributing hydraulic power as compared with the disadvantages of steam are so considerable as, certainly in mail and passenger steamships, if not also in many merely cargo steamers, to counter-balance any increase in the first outlay. When machinery on deck, or at a distance from the boiler, is worked by steam, there is a great loss through condensation, besides, much trouble arises also from the heating and cooling of the long lines of steam-pipes, and the consequent expansion and contraction, causing leakages at joints, &c., while sometimes owing to the working of winches, windlasses and stearing gears being entrusted to unskilled men, cylinders are burst and other damage occasioned by the accumulation of condensed water. The wear and tear of steam-driven machinery subject to varying loads is also very excessive, and the multiplicity of cog-wheels, shafts, bearings and joints, when steam-winches are in full swing on the deck of a ship, are simply intolerable on account of the noise. In some passenger steamers, which call at no intermediate ports, this noise may but slightly affect the comfort of the passengers, as they frequently embark after all the cargo is stowed, and land before bulk is broken, but the mere noise occasioned by the hoisting of ashes from the stoke-holds is a common source of complaint.

With hydraulic power, on the other hand, there is an entire absence of noise, there is no loss of power through variation in the temperature of piping, and considerably reduced liability to burst pipes and escapes at joints. For cold weather, a non-freezing fluid is added to the water used. This generally consists of a solution of calcium chloride which will not solidify at a temperature below zero.

The increased first cost of a hydraulic installation is largely due to the necessity of having engines capable of creating the required pressure in the accumulator, and, where cargo lifts are adopted, to their construction. These are however found to be frequently specially advantageous. On board a British India steamer, four lifts working two hatches, discharged 1,116 tons of rice,

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and took on board 150 tons of coffee in ten hours, whilst, as a testimony to the quietness of the system, it is stated that in the open roadstead of Madras sixty wild Australian horses were discharged in four hours. In extremely bad weather, with a vessel rolling badly, the hydraulic hoists have proved of great advantage, it being only necessary to float the weight, when the load is up the hatch before there is time to foul the ship's deck. It is recorded that on one occasion in the Union Company's steamer *Tartar* by hydraulic appliances with which the vessel is fitted, although a nasty sea was running, and everybody had to be hoisted in baskets, in one day 1,900 bales of wool, 400 packages of sundries, besides passengers' baggage and mails were taken on board in one day. With hydraulic winches it is a simple matter to lift either heavy or light weights expeditiously. When required to discharge light cargo, such as tea, grain, &c., four ropes can be worked out of one hold, the engines constantly running at thirty revolutions per minute, and with barrels and warping ends of two feet diameter, a discharging speed of 187 feet per minute is obtained. For the lightest load the hydraulic engine is set at 6-inch stroke, and when the full two-ton load is to be raised, the sliding bolts are withdrawn and the eccentric discs allowed to revolve into the position giving the greatest throw of the crank-pin, and the bolts are then allowed to drop into the holes. The engine is then at a stroke of 18 inches, and there are three other intermediate positions. In this way the quantity of water used is made to approximate to the work done, and as the stroke can be altered while the engine is running no time is lost. When raising the heavy loads the engine does not exceed a speed of 20 revolutions per minute, involving *minimum* wear and tear. Gearing is entirely dispensed with, and consequently there is an absence of noise as well as of vibration. Similar favourable remarks might be made regarding steering gears, capstans, windlasses, &c., if our limit of space permitted; but sufficient has been advanced to show that the greater adoption of hydraulic power is well deserving the attention of steamship owners.

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CORRESPONDENCE.

KENTISH KNOCK LIGHT-VESSEL.

To the Editor of the "Nautical Magazine."

SIR,—A short time ago notice was issued by the Trinity authorities, that the Kentish Knock and Long Sand light-vessels were altered in their *charted* positions to the extent of 1½ mile.

In Admiralty Sheet No. 1406, corrected up to the year 1886, the Kentish Knock light was placed in lat. 51° 39′ 30″ N., and long. 1° 41′ 0″ E., 2 miles outside, or to the eastward of the shoal. The Chart No. 1406 just issued, corrected up to November, 1889, places the above-named light-vessel in 51° 39′ 30″ N., and 1° 43′ 10″ E., 3½ miles E. by S. ½ S. of the shoal.

What are we to infer from this? Has the light-vessel been removed 1½ nautical mile to the eastward of her former position, or has she been placed upon the charts in a wrong position?

I have for many years past noticed that the N.E. by N. true magnetic course, from the Downs to the Kentish Knock light *never* came out correct. After carefully allowing for the in-draught of the flood tide, and taking many azimuths on that course, to prove the deviation of the compass was correctly allowed for, I have generally found my vessel drawn inside the Kentish Knock light-vessel. This leads me to think that the position assigned this light-vessel on the former published Admiralty Chart No. 1406 has been incorrect.

If such has unfortunately been the case, what about several poor shipmasters, who have been suspended for getting their vessels aground on the Knock Sand. I should think such men ought to be exonerated from blame, and recompensed.

The new position of the light-vessel makes a difference of nearly half a point in the course from the Downs to the Kentish Knock, and, as this part of the coast is frequented by immense numbers of steamers, the more publicity this has the better it will be for all concerned to prevent disaster.

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I may add the Long Sand light-vessel is charted one and a-half mile further east than she formerly was.

Remaining, Sir, yours very obediently,

RHADAMANTHUS.

Off Flamborough Head, January 25th, 1890.

NAVIGATION FROM THE CHANNEL TO THE TEXEL.

To the Editor of the "Nautical Magazine."

SIR,—Yet another steamer has been ashore near the Texel, making at least half-a-dozen in the last three months, all of which have been bound from the Channel to Bremerhaven or Hamburg. May I give a word of warning to brother shipmasters as to the causes that set them out of their course here.

There is no run in home trade waters where it is so *absolutely necessary* for the shipmaster to study the set of the tide.

Suppose a ship (as at least one of these did) leaving the E. Goodwin at L.W. Dover, she will have, for twelve hours of her run across, a tide setting (roughly) about four points on her port-bow and driving her down into the bight. For six hours she will have an opposite tide, but it will be in the middle of her run, just where she will least feel its influence. It is therefore *most important* that on leaving the E. Goodwin the master should know how the tide is at the time, and *how long* he will have it on his *port-bow* during the run across.

On the line of the course between the Goodwin and Terschelling the tide (roughly) runs about south from L.W. Dover to H.W. Dover, the stream turning at H.W., and running the opposite way for about six hours; and, the strength of the tide being greatest near the Goodwin and Texel, a ship leaving the Goodwin at L.W. Dover will, unless large allowance is made, find herself miles to the southward when she gets across. Another thing, these ships have come up Channel on a course nearly east. At the Goodwin they turn up N.E. and, in consequence of the "Gaussin" error on their compass, will not make the course which their deviation card would give them, but will, more or less, make to the eastward of it. I generally found my compass had

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about half a point of this error here. The best thing to guard against this is to haul the ship up to her North Sea course, when off the S. Foreland lights in one, and see what the error is by their bearing.

These two things are the causes which put so many steamers ashore about Texel.

Under no circumstances should it be attempted to make any light, unless the Terschelling ship, and this only in fairly clear weather, for the low land and the inland Zuyder Zee causes, all winter through, misty, thick weather on the shore, often obscuring the lights. If the least thick it is best to keep well out, to run a full distance by log, and when the soundings give sufficiently deep water, to shape a course for Borkum; then, when it is estimated that the ship is as far as Nordernay, run into 13 fathoms and keep in that water, the Weser ship is then bound to be picked up. This is a better plan than trying to make Heligoland.

Having made considerable study of the tides around our coasts, and being the author of a work on that subject which is used on board H.M.'s ships, and therefore I presume worthy of credence, I think I may be allowed to pose as an authority in the matter, more especially as for some years I was constantly running in that trade.

I am, Sir,

Your obedient servant,

WILLIAM B. WHALL.

Sunderland, February 16, 1890.

[A new lightship has been placed off the Texel. See Nautical Notice No. 101 in current issue.—Ed. *N.M.*]

SOME CAUSES OF MARINE CASUALTIES.

To the Editor of the "Nautical Magazine."

Sir,—I hope you will excuse an old sailor's reference to the article which appeared in your January number, "Some Causes of Marine Casualties."

Commencing like yourself, Sir, with the gallant Admiral Fitzroy, I gladly bear testimony to his memory, and although he is long since dead, his words of weather-wisdom still speak effectually to

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the careful sailor. The Admiral's barometer, and his wise laws printed thereon, have deservedly become like household words, and an invaluable guide to seamen. Of course, there will be found some who pay no regard to the barometer, let it indicate weather foul or fair from north, south, east, or west.

This may be one more cause for casualties, and not a few of our maritime disasters, if carefully investigated and traced to their first cause, would probably bring out the fact that neglect of that true friend ultimately led to serious results, more or less contingent upon and associated with other causes, such as unseaworthiness and undermanning, factors likely to come prominently to the front when battling with the elements.

While writing on the barometer, I may say that in my experience with officers of the merchant service, a good many of them have been found deplorably ignorant of its use, and how to read it. This should not be the case; all officers when under examination for any grade of certificate, home or foreign, should be tested in respect of barometer readings, and should have a general knowledge of its various phases in different latitudes, denoting fine or foul weather. Special attention should be given to the necessity for careful and frequent readings when navigating the Indian Ocean or the China Seas, since in these latitudes, and some other parts of the world, a few tenth's fall from the normal may mean a dangerous proximity to a cyclone.

Your official log indicates that our Mercantile Marine is not yet perfection in every respect. *Wrinkles* is right about the sennit and spun-yarn business; it is a waste of time and a weariness to the flesh. As for handling the *blue pigeon*, if you had not let the cat out of the bag, many of our modern mariners would have remained in blissful ignorance of the term, and in all likelihood would imagine that it was Noah's bird still on the wing, seeking rest and finding none. I have seen many awkward attempts at heaving the lead, and always gave the awkward heaver a good wide berth. Swinging it in the old style on board of merchant ships is seldom seen in these days. I am glad to note that undermanning is at last becoming a recognised cause of casualties. To my mind it is one of the principal, and one that should be dealt with by a

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compulsory manning scale for every ship, each one being fairly manned in accordance with her rig, and the labour-saving appliances for immediate use at sea and in port, whether required by day or night.

Altering the rig from ship to barque does not reduce the sails on the other masts; neither does the substitution of four masts for three lessen the labour in working the ship; but the latter change very much increases the number of ropes and other gear, and on a dark night, especially with a mixture of foreign Johnnies, confusion becomes worse confounded.

I have seen sails hanging in the gear waiting for the sailors to furl them for a good long time, and it is not uncommon for the tramp type to trust to Providence to a large amount, and allow the sails to hang unfurled for hours, the crew being insufficient in number to *clue up and furl* ship-shape and Bristol fashion. The instance of undermanning referred to in the article under review is, I hope, an extreme one. I should like to comment on various other points raised in your summary, but having regard to your space, will add only one word in conclusion. I am glad to note that in only two cases was disaster attributed to the drunkenness of master or officers.

AN OLD SAILOR.

PORT OF NOVORISSISK.

To the Editor of the "Nautical Magazine."

SIR,—Having just left the new port (Russian) of Novorissisk, and bound to Gibraltar for orders, I wish to give shipmasters and others some information about this place.

On my arrival, January 21st, 1890, the weather was fine, but towards evening it blew a gale from the S.S.E., which sends in a heavy sea, the port being quite open in that direction and having the full sweep of the Black Sea.

The result of this heavy sea and wind caused the ships alongside of the piers (which are in a S.S.E. direction) to pitch and range heavily, and some of them to strike the ground, there being only 21 ft. of water at the pier ends, 260 ft. from the end, inshore 19 ft., 500 ft. from the end 11 ft.

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The S.S.E. gales send in an eight-foot sea. Steamers are berthed one astern of the other, each pier taking two vessels on either side, the inshore steamer having 10 ft. 6 in. depth of water under her stern post.

The barometer rarely gives any indication of approaching bad weather. The principal signs of an approaching S.S.E. gale is the capping of the high land at the west side of the bay with heavy looking clouds; then it is necessary for steamers to get up steam and be prepared to steam away from the piers to the anchorage in the bay. Unfortunately, steamers that are in ballast are not at all times able to steam away from the piers on account of the heavy surf and wind being against them.

The ground alongside of the piers and in the bay is composed of coarse shingle. Consequently every S.S.E. gale that blows causes the sea to silt the shingle up against the piers; the result is a continual shoaling of the water, which a properly constructed breakwater would prevent.

From January 21st to 31st, we had five S.S.E. gales, each lasting thirty hours. During the above time some of the steamers broke the piles, of which the piers or jetties are formed, the stumps coming in contact with the vessels' bilges, bulging the plates in.

A strange master going to Novorissisk should never ask for information about the weather from the people connected with the piers, or railway. They are sure to inform him that the S.S.E. winds cause very little trouble, and no danger, which perhaps may lull him into false security, until some night he finds his vessel's stern-post carried away through striking the stony ground, which means dry-docking at Sevastopol. The Russian Government commenced to build a breakwater from the east side of the bay, which if they had completed would make Novorissisk one of the best and safest ports in the Black Sea, with the addition of a small breakwater from the west side of the bay. I learn from the residents of the above place that it was the railway managers (who also own the piers) that recommended the Government to cease building the breakwater, as financially it would effect their (the railway) prospects for a time.

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Without a breakwater and the present system of loading, and depth of water, it is dangerous to load alongside of the piers in winter time. The heaviest shipments are made in the winter months, and I consider that we are exempt from going alongside of the piers according to our charter-party, which quotes so near thereunto as she may safely get, and to always load afloat, which I consider is at anchor in the bay, until they build efficient breakwaters, then, and not till then, are the piers safe to load alongside of in winter.

Last year 190 British steamers visited this port, and the trade is still increasing, and yet we hear nothing of an English Consulate being established, in consequence of which British shipmasters are placed in an awkward position.

NORTH SHIELDS MASTER MARINER.

Gibraltar, February 18th, 1890.

BOOKS RECEIVED.

We are glad to acknowledge the receipt of a number of a new nautical periodical entitled *Boletin del Centro Naval*, October, Buenos Aires, containing a number of valuable papers, the first of which deals exhaustively with the question of Chronometers. Another new publication which we are glad to notice is *Revista do Osservatorio*, October and November, Rio de Janeiro, containing records of meteorological and other scientific observations made at Rio and also at Santa Cruz.

Annales Hydrographiques (Paris), 2nd series, Vol. 2, for 1889, gives an account of a cyclone in the Indian Ocean in 1888, and a typhoon in the China Sea in 1889; also a graphic representation of the forces producing deviation of the compass; and particulars of recent soundings taken in the Behring Sea, as well as in the Atlantic and Pacific Oceans.

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Revue Maritime et Coloniale (Paris) for January has a paper on meteorological periodicity, and continues the observations on Oceanography.

Mittheilungen aus dem Gebiete des Seewesens (Pola), No. 12, has a valuable paper by Eugene Gelcich on the rectification of the ship's daily observations by the Hour-Angle tables and the Pagel correction.

Aus See nach Bremen-Stadt (Bremen) for 1890, illustrated with two charts, gives sailing directions for the port of Bremen, port charges, &c.

With the new year *Rivista Marittima* (Rome) commences a series of papers from the pen of Captain Salvatore Raineri, very copiously illustrated, on the great merchant steamers of the world.

We have also received recent numbers of *Revista General de Marina* (Madrid), January; *Boletin de la Sociedad Geografica de Madrid*, *Revista Maritima Brazileira* (Rio de Janeiro), *Railroad and Engineering Journal* (New York), *United Service* (New York), *Lippincott's Magazine* (Philadelphia), &c., &c.

OFFICIAL RETURN OF BRITISH WRECKS IN JANUARY, 1890.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of January, 1890, and the number of lives lost, are as follows:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	59	22,396	38
Steam	9	9,576	29
Total	68	31,972	67

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in January relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—THOMAS GRAY, Assistant-Secretary, Marine Department.—Board of Trade, 1st February, 1890.

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TIDE TABLES FOR MARCH, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	LONDON BRIDGE.		HULL.		NORTH SHIELDS.		LEITH.		DEVONPORT.		DOVER.		WESTON-SUPER-MARE.		LIVERPOOL.		GREENOCK.		QUEENSTOWN.		KINGSTOWN.		LONDONDERRY.		BREST.	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
S	1	9 31	10 17	1 57	2 36	11 41	—	10 85	11 14	0 32	1 12	6 38	7 20	1 57	2 40	7 6	7 49	7 37	8 20	0 23	1 6	6 57	7 36	4 18	4 49	—	0 8
S	2	11 1	11 39	3 15	3 53	0 22	0 59	11 52	—	1 52	2 32	8 1	8 37	3 23	4 3	8 28	9 1	9 0	9 35	1 47	2 24	8 13	8 47	5 21	5 48	0 48	1 23
M	3	—	0 15	4 26	4 54	1 31	1 56	0 24	0 49	3 9	3 39	9 7	9 32	4 37	5 6	9 28	9 50	10 4	10 29	2 55	3 21	9 16	9 42	6 10	6 30	1 52	2 14
T	4	0 45	1 9	5 17	5 37	2 16	2 35	1 10	1 30	4 6	4 31	9 53	10 13	5 31	5 54	10 10	10 29	10 51	11 11	3 44	4 5	10 4	10 23	6 50	7 10	2 35	2 54
W	5	1 30	1 49	5 56	6 14	2 53	3 10	1 49	2 7	4 55	5 17	10 33	10 52	6 16	6 35	10 46	11 3	11 30	11 49	4 25	4 43	10 40	10 55	7 29	7 47	3 12	3 29
T	6	2 8	2 24	6 31	6 48	3 26	3 42	2 24	2 40	5 36	5 54	11 10	11 28	6 53	7 10	11 20	11 36	—	0 7	5 0	5 17	11 10	11 25	8 4	8 19	3 46	4 2
F	7	2 40	2 54	7 5	7 21	3 57	4 12	2 55	3 10	6 11	6 28	11 46	—	7 27	7 43	11 52	—	0 24	0 41	5 34	5 50	11 40	11 56	8 33	8 47	4 17	4 33
S	8	3 9	3 24	7 37	7 53	4 28	4 44	3 25	3 40	6 45	7 1	0 3	0 20	7 59	8 15	0 8	0 24	0 58	1 15	6 6	6 22	—	0 12	9 2	9 17	4 49	5 5
S	9	3 40	3 55	8 9	8 25	5 1	5 18	3 56	4 12	7 17	7 33	0 38	0 56	8 31	8 46	0 40	0 56	1 31	1 47	6 38	6 55	0 29	0 46	9 32	9 47	5 21	5 37
M	10	4 11	4 27	8 41	8 57	5 35	5 52	4 29	4 46	7 49	8 5	1 14	1 32	9 1	9 16	1 13	1 30	2 3	2 19	7 12	7 29	1 3	1 21	10 2	10 18	5 53	6 10
T	11	4 44	5 0	9 14	9 33	6 10	6 28	5 4	5 22	8 22	8 39	1 50	2 8	9 32	9 49	1 47	2 4	2 36	2 53	7 46	8 4	1 39	1 57	10 36	10 55	6 27	6 45
W	12	5 18	5 35	9 52	10 12	6 47	7 8	5 42	6 4	8 56	9 15	2 27	2 47	10 6	10 23	2 22	2 41	3 11	3 30	8 22	8 41	2 16	2 37	11 17	11 44	7 5	7 28
T	13	5 55	6 16	10 34	11 0	7 31	7 57	6 28	6 54	9 37	10 0	3 8	3 31	10 41	11 2	3 1	3 24	3 51	4 13	9 2	9 26	3 0	3 24	—	0 16	7 52	8 17
F	14	6 40	7 9	11 30	—	8 27	9 2	7 22	7 56	10 26	10 54	3 56	4 23	11 29	—	3 50	4 21	4 39	5 8	9 54	10 27	3 52	4 26	0 52	1 33	8 46	9 22
S	15	7 39	8 16	0 5	0 45	9 43	10 28	8 36	9 22	11 27	—	4 54	5 31	0 2	0 43	5 0	5 47	5 42	6 24	11 8	11 56	5 6	5 48	2 19	3 6	10 6	10 56
S	16	8 59	9 48	1 27	2 11	11 15	—	10 10	10 56	0 10	0 59	6 13	6 59	1 31	2 20	6 38	7 28	7 10	7 58	—	0 44	6 31	7 15	3 50	4 31	11 46	—
M	17	10 39	11 24	2 54	3 36	0 1	0 41	11 36	—	1 45	2 24	7 45	8 25	3 7	3 50	8 12	8 48	8 44	9 22	1 31	2 12	7 57	8 34	5 6	5 34	0 31	1 10
T	18	—	0 2	4 13	4 45	1 16	1 45	0 10	0 39	3 13	3 48	8 58	9 27	4 29	5 4	9 18	9 45	9 55	10 25	2 47	3 18	9 7	9 37	6 0	6 26	1 42	2 10
W	19	0 37	1 8	5 12	5 36	2 11	2 35	1 5	1 30	4 19	4 48	9 54	10 20	5 35	6 2	10 9	10 32	10 52	11 17	3 46	4 11	10 3	10 25	6 51	7 15	2 35	2 58
T	20	1 28	1 52	6 0	6 23	2 57	3 18	1 54	2 16	5 14	5 37	10 44	11 7	6 27	6 50	10 55	11 17	11 41	—	4 34	4 56	10 46	11 6	7 38	8 0	3 20	3 41
F	21	2 13	2 34	6 45	7 6	3 38	3 58	2 36	2 55	6 0	6 21	11 30	11 52	7 12	7 33	11 38	11 58	0 4	0 26	5 18	5 39	11 26	11 46	8 20	8 38	4 2	4 23
S	22	2 54	3 13	7 26	7 46	4 18	4 38	3 14	3 33	6 42	7 2	—	0 18	7 53	8 11	—	0 18	0 47	1 7	6 0	6 19	—	0 6	8 56	9 13	4 43	5 2
S	23	3 33	3 51	8 5	8 23	4 57	5 16	3 52	4 11	7 19	7 36	0 34	0 55	8 29	8 46	0 37	0 56	1 26	1 45	6 37	6 55	0 26	0 45	9 30	9 47	5 20	5 37
M	24	4 10	4 28	8 41	8 59	5 35	5 54	4 30	4 49	7 53	8 9	1 15	1 34	9 2	9 18	1 14	1 31	2 3	2 21	7 13	7 31	1 4	1 23	10 8	10 20	5 54	6 12
T	25	4 45	5 1	9 17	9 35	6 13	6 31	5 7	5 25	8 25	8 40	1 53	2 11	9 34	9 50	1 48	2 5	2 38	2 55	7 48	8 5	1 41	2 0	10 37	10 57	6 30	6 48
W	26	5 19	5 36	9 53	10 12	6 49	7 8	5 44	6 5	8 56	9 12	2 29	2 48	10 5	10 20	2 22	2 40	3 12	3 30	8 22	8 40	2 19	2 39	11 19	11 46	7 7	7 27
T	27	5 55	6 17	10 33	10 58	7 30	7 55	6 27	6 51	9 29	9 47	3 7	3 27	10 36	10 55	3 0	3 21	3 50	4 11	9 0	9 21	3 0	3 23	—	0 16	7 48	8 10
F	28	6 38	7 1	11 25	11 57	8 23	8 54	7 17	7 48	10 7	10 33	3 48	4 12	11 19	11 51	3 44	4 13	4 34	5 0	9 45	10 15	3 48	4 18	0 49	1 26	8 37	9 11
S	29	7 30	8 4	—	0 34	9 32	10 15	8 25	9 8	11 4	11 43	4 42	5 18	—	0 30	4 49	5 32	5 32	6 10	10 54	11 38	4 54	5 34	2 8	2 52	9 51	10 37
S	30	8 42	9 29	1 14	1 55	10 59	11 41	9 52	10 34	—	0 26	5 58	6 39	1 13	1 58	6 20	7 7	6 53	7 37	—	0 23	6 15	6 55	3 35	4 14	11 28	—
M	31	10 17	11 0	2 35	3 14	—	0 21	11 18	11 48	1 9	1 51	7 20	7 58	2 41	3 21	7 48	8 25	8 19	8 57	1 5	1 45	7 34	8 10	4 48	5 17	0 6	0 44

TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* — *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−8 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 13	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+8 8	Brest
Boulogne	+0 18	Dover
Bridport	+0 24	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadiz	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 37	Dover
Campbellton	−0 23	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bar	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 37	Londonderry
Coquet Road	−0 23	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 56	Dover
Exmouth	+0 38	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 12	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 53	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 53	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 8	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 43	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 18	Devonport
Peterhead	−1 48	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 38	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 22	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 3	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 22	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+2 20	Queenstown
Whitby	+0 23	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 48	London
Youghall	+0 13	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt.= Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
93	England—East Cst.—River Medway Entrance	Submarine mine fields.
94	" " " Pinup and Gillingham Reach	Temporary alteration in buoyage.
95	" West Cst.—Liverpool Bay—Formby Light-Vessel	Light to be altered in character.
96	" " River Mersey Entrance—North Wall Lt.-ho.	Obscured sector.
97	" " Bristol Chan.—Barry Is.—Barry Dock	Lights on breakwaters.
98	" " " English & Welsh Grounds Light-Vessel	Light and fog-signal to be altered.
99	Scotland—East Cst.—Bell Rock Lighthouse	Explosive fog-signal.
100	Ireland—South Cst.—Cork Harbour	Delay in mooring light-buoy.
101	North Sea.—Texel Approach	New light-vessel and fog-signal.
102	Baltic Entrance—Kattegat—Lilla Warholmen	Southern leading light to be altered.
103	Baltic.—Russia—Libau	Alteration in pier-head lights.
104	Norway—W. Cst.—Karmsound—Bukö	New light.
105	" " Oksebaasen	New light.
106	" " Buddybet—Inner Harö	New light.
107	Spain—North Cst.—Bilbao Bay	Buoys marking breakwater.
108	Mediterranean—Italy—Naples Roads	Lights on moles.
109	" Grecian Arch.—Levitha Is.—Spano Point	New lights.
110	" " Mityleni Chan.—Gymno Is.—Ali Point	New lights.
111	Red Sea—Forth Musawwa Chan.—Difnien Is.	New light.
112	Canary Islands—Gran Canaria—Maspalomas Point	New light.
113	Cape Verde Islands—St. Nicholas—St. George Bay—Rolla Road—Preguiza	New lights.
114	Africa—South Coast—Knysna Harb.—Outer Obelisk Point	Signal and pilot station.
115	" East Cst.—N. Approach to Zanzibar	Non-existence of reported bank.
116	Gulf of Aden—Aden Harb.	Permanent light-vessel replaced.

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Monthly Abstract of Nautical Notices—*Continued.*

No.	Place.	Subject.
117	Ceylon—South Cst.—Great Basses	Unsuccessful search for shoal ground.
118	„ Barberyn Is. and Dondra Head	New lights.
119	Malacca Strait—E. Shore—Larút River	Beacon lights
120	Eastern Archipelago—Java—Batavia	Lights to be altered.
121	„ „ „ Madura Strait—Zwantyes Reef	Light altered.
122	China Sea—Makassar Strait—Balabalagan (Little Paternoster) Is.	A sand cay to S.E.
123	Sulu Sea—Philippine Is.—Basilan Strait	Reef in fairway.
124	Japan—Sikok—Nomi Harb.—Kogi Saki	Foul ground.
125	Australia—N. Coast—Bathurst Is.—Cape Helvetius	Sunken rock.
126	„ E. Coast—Inner Route	Sunken rock, &c.
127	„ „ Princess Charlotte Bay—Taiwan Shoal	Amended position and particulars.
128	„ „ Turtle Group—Gunga Shoal	Position and new reef.
129	„ „ Lookout Point	Shoal spot.
130	„ „ Moreton Bay—Howe or N. Chan.	Alteration in lighthouses.
131	New Zealand—Middle Is.—W. Cst.—Common Head	Sunken rock.
132	New Caledonia—Port Noumea	New lights.
133	North Pacific—Sandwich Is.—Oahu—Honolulu	Time-signal at planing mill.
134	North America—U.S. Pacific Cst.—California—San Francisco Harb.—Oakland Harb.	New light and fog-signal.
135	„ U.S. Pacific Cst.—California—Buchon Pt.	Automatic signal-buoy withdrawn.
136	„ U.S. Pacific Cst.—Oregon—Columbia River—Warrior Rock	New fog-signal.
137	„ U.S. Pacific Cst.—Oregon—Columbia River Ent.	Alteration in buoyage.
138	South America.—Magellan Strait—Broad Reach—Sandy Point	Doterel wreck-buoy not in position.
139	„ E. Cst.—Rio de la Plata—Lobos Is.	Unsuccessful search for shoal.
140	„ E. Cst.—Cape Frio	Position of signal station.
141	„ River Amazons—River Pará	Shoals.
142	„ River Amazons—River Pará	Intended lights.
143	United States—New York—Long Is. Sound—Oyster Bay	New light and fog-signal.
144	„ Massachusetts—Boston Harb.—Deer Is.	New light.
145	Bay of Fundy—River Petitcoudiac—Folly Point	Intended light.
146	Novia Scotia—S.E. Cst.—Little Hope Is.	Light altered in character.
147	Newfoundland—S.W. Cst.—La Poile Bay	Various sunken rocks.
148	Gulf of St. Lawrence—Northumberland Strait—Bay Verte—Cold Spring Head	Intended new light.

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NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

93.—ENGLAND.—*East Coast.—River Medway Entrance.—Submarine Mine Field.*—With reference to notice in 1889, on the establishment of a temporary submarine mine field on the northern shore of river Medway entrance; from 3rd February, 1890, practice with submarine mines will take place for a period of about two months, on the northern side of river Medway entrance, within the under-mentioned area, which is mainly on the Grain spit, but extends into the channel a short distance in the vicinity of the Grain Edge buoy. This area will be marked by four buoys, placed as follows:—

(1.) SOUTH-EAST BUOY will be moored in 21 feet, with Minster church bearing S. by E. ½ E., and Garrison point lighthouse S.W. by W. ½ W., distant 12½ cables.

(2.) SOUTH-WEST BUOY will be moored in 42 feet, with Minster church bearing S.S.E. ½ E., and Garrison point lighthouse S.W. ½ W., distant 7¼ cables.

(3.) NORTH-EAST BUOY will be moored in 11 feet, with No. 1 buoy bearing S. by E. ½ E., distant 3¼ cables.

(4.) NORTH-WEST BUOY will be moored in 7 feet, with No. 2 buoy bearing S. by E. ½ E., distant 3¼ cables.

Mariners are cautioned not to navigate or anchor within the above-mentioned limits. The depths given are at L.W. spring tides. *Variation*, 17° *W.*

94.—ENGLAND. — *East Coast.—River Medway. — Temporary Alterations in Buoyage between Pinup and Gillingham Reaches.*—The two buoys marking the north side of the channel of the river Medway, between Pinup and Gillingham Reaches, have been withdrawn for dredging purposes; and three mooring buoys, chequered red and white, have been temporarily placed on the south side of the channel in the following positions:—

No. 1 BUOY.—In 16 feet water, with Folly point beacon bearing N.N.W. ⅛ W., distant 2¼ cables.

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No. 2 Buoy.—In 16 feet water, with Folly point beacon bearing N.W. ¼ W., distant 2½ cables.

No. 3 Buoy.—In 18 feet water, with Folly point beacon bearing N.W. by W. ⅛ W., distant 2¾ cables.

Proceeding up the river, these buoys should be left close on the port-hand. Two green buoys for dredging purposes, have also been placed about half-a-cable westward of the positions previously occupied by the buoys marking the north side of the channel.

Note.—The Admiralty plan, Bishop's Ness to Rochester, No. 1834, will not be altered until the dredging is finally complete and permanent buoys placed. The depths given are at L.W. spring tides. *Variation*, 17° *W.*

95.—England.—*West Coast.—Liverpool Bay.—Formby Light-Vessel.—Intended Alteration in Character of Light.*—On or about 30th April, 1890, the following alteration will be made in the character of the light exhibited from Formby light-vessel, entrance to Crosby channel, Liverpool bay. It will be a *flashing red* light, showing a *flash every twenty seconds.* The fog signal will be continued as at present. Position, lat. 53° 31′ 20″ N., long. 3° 11′ 40″ W.

96.—England. — *West Coast.—River Mersey Entrance.*—(1.) *North Wall Lighthouse.—Intended Obscured Sector.*—On 1st March, 1890, the *fixed white* light exhibited at North Wall lighthouse, eastern side of river Mersey entrance, will be obscured inshore of the bearing S. 21° E., instead of changing to *red* on that bearing as at present.

(2.) *North Wall Buoy.—Intended Alteration in Name.*—Also, on the same date, the name of North Wall, black can-buoy, eastern side of Crosby channel, river Mersey entrance, will be altered to C XI. *Variation*, 19° *W.*

97.—England.—*West Coast.—Bristol Channel.—Barry Island. —Barry Dock.—Lights on West and East Breakwaters.*—With reference to notice in 1889, on the intended establishment of lights, fog and night-signals, at Barry dock, Barry island; the lights at the ends of the Western and Eastern breakwaters are exhibited:—

(1.) The light exhibited at the end of the Western breakwater is

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an *occulting white* light, every *five seconds*, as follows:—Duration of light, *three and a-half seconds*, followed by an *eclipse* of *one and a-half second*. It is elevated 40 feet above H.W. Position, lat. 51° 23′ 30″ N., long. 3° 15′ 20″ W.

(2.) The light exhibited at the end of the Eastern breakwater is a *fixed white* light, elevated 20 feet above H.W.

98.—ENGLAND.—*West Coast.—Bristol Channel.—Alteration in Character of the Light and Fog-Signal of the English and Welsh Grounds Light-Vessel.*—On or about the 1st March, 1890, the changes already advertised as about to be made on board the English and Welsh grounds light-vessel (*see* Notice, 1889) will be carried into effect, viz.:—The light will be altered from one white flash every minute, as at present, to *one white flash every thirty seconds*. Also, a fog-horn will at the same time be placed on board this vessel, which will sound in thick or foggy weather *two blasts* (*high-low*) in quick succession every *two minutes*. Further notice will be given when the above alterations are effected.

99.—SCOTLAND.—*East Coast.—Fog-Signal at Bell Rock Lighthouse.—Entrance to Firths of Forth and Tay.*—On and after the 17th March, 1890, an *explosive fog-signal* will be established at the Bell rock lighthouse. The signal will consist of a cotton powder charge, exploded from the top of a jib surmounting the lantern, and will give a report (like the discharge of a gun) at intervals of *ten minutes* during thick or foggy weather. The fog-bell on the balcony of the lighthouse will continue to be sounded as heretofore.

100.—IRELAND.—*South Coast.—Cork Harbour.—Delay in Mooring Experimental Light-Buoy Eastward of Harbour Rock.*—With reference to Notice 52, p. 154, on the intended mooring, on 21st January, 1890, of an experimental light-buoy eastward of Harbour rock, or about 180 feet S.S.W. of No. 1 or eastern Harbour rock buoy, entrance to Cork harbour; by notice, dated 21st January, 1890, this buoy will not be moored in position until further notice. *Variation*, 22° *W.*

101.—NORTH SEA.—*Texel Approach.—Intended Light-Vessel, Exhibiting a Flashing White and Red Light, with Fog-Signal.*—In the month of February, 1890, a light-vessel will be moored in a depth of 16 fathoms, in the approach to the Texel, with Kykduin

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lighthouse bearing S. 73° E., distant 15¼ miles. The light will be a *flashing white* and *red* light, showing every *thirty seconds two white flashes* in quick succession, then an eclipse of *ten seconds*, followed by a single *red flash*. It will be shown from the mainmast, elevated 36 feet above the sea (in bad weather, only 31 feet), and visible from a distance of 11 miles. The light-vessel, with one mast and a jigger mast, will be painted red, with a broad white streak, upon which on both sides will be the word *Haaks* in black letters; and will carry a red ball at the masthead as a daymark. She will exhibit a white riding light from the fore-stay. Position, on Admiralty chart, lat. 52° 28′ N., long. 4° 17′ E. Also, from this light-vessel, during thick or foggy weather, a caloric siren will give *two blasts* in quick succession every *two minutes*. Should the siren not be ready for use, or be out of order, a bell will be sounded *two strokes* in succession, followed by a pause every *thirty seconds*.

Note.—When from any cause the flashing light cannot be exhibited, a fixed *white* lantern light will be shown from the masthead, and a *red* flare-up every 10 minutes from above the gunwale. If this vessel has drifted from her station, the usual lights will not be exhibited, but a fixed *red* light will be shown from each end of the vessel. By day a red flag will be hoisted above the red ball at the masthead. Should a vessel be seen standing into danger, a gun will be fired, and repeated if necessary; also the signal-flags J. D. of the International Code, "You are in danger," will be hoisted and kept flying until answered. A bright rocket immediately after a gun will indicate that assistance from the shore is required. To mark the permanent position of the light-vessel, two anchor-buoys, both painted red with a white horizontal stripe, and with *H. No.* 1 and *H. No.* 2 on them, respectively, in black letters, will be moored north and south, distant 3 cables from each other. *Variation*, 15° W. Further particulars will be published in due course.

102.—Baltic Entrance.—*The Kattegat.—Swedish Coast.—Lilla Warholmen.—Intended Alteration in Southern Leading Light.*—With reference to notice in 1889, on the exhibition of two small leading lights on Lilla Warholmen (Varholmen); by further

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notice, the following alteration will be made as soon as possible in the southern leading light. It will be a *fixed white* light. Both the leading lights are thus fixed white lights. Position, lat. 57° 42′ 20″ N., long. 11° 42′ 40″ E.

103.—Baltic.—*Russian Coast.—Libau.—Alterations in Pier-Head Lights.*—With reference to notice in 1889, on the exhibition of a fixed *white* light from each of the pier-heads at Libau, on 6th November, 1889, a fixed *red* light was exhibited from beacons erected on each of the pier-heads at Libau; the fixed *white* lights being discontinued. The northern light at Libau is elevated 32 feet above the sea and 23 feet above the ground, and is situated 44 yards from the extremity of the pier. The southern light, elevated 31 feet above the sea and 21 feet above the ground, is situated 130 yards from the extremity of the pier. Position, lat. 56° 31′ N., long. 20° 59′ E.

104.—Norway.—*West Coast.—Karmsound.—Occulting Light, with Red and White Sectors on Bukö.*—With reference to notice in 1889, on the intended exhibition of a light of small power, and not to be constantly watched, on Bukö, eastern coast of Karmö, Karmsound. On 1st January, 1890, the light would be exhibited. The light is an *occulting light* with *red* and *white* sectors; it shows *white* between the bearings of N. 3° E. and N. 4° W.; *red* between N. 4° W. and N. 35° W.; and *white* between N. 35° W., through west, and S. 28° E. Northward of Salhus the light is not visible westward of the bearing S. 5° E. The light should be visible from a distance of 6 miles. Position, lat. 59° 21′ 10″ N., long. 5° 18′ 50″ E. *Variation*, 15° *W.* This light will be exhibited annually from 1st August to 1st May.

105.—Norway.—*West Coast.—Alternating Light on Oksebaasen.*—With reference to notice in 1889, on the intended exhibition of a light of small power, and not to be constantly watched, on Oksebaasen, eastward of Valderö, west coast of Norway; on 1st January, 1890, the light would be exhibited. The light is an *alternating* light, visible between the bearings of N. 35° E., through east, and S. 33° W.; or from westward of Kjeholmen, to westward of Hanen; elevated 33 feet above the sea, and visible from a distance of 6 miles. The lighthouse is 10 feet high. Position,

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lat. 62° 30′ 35″ N., long. 6° 9′ 25″ E. *Variation*, 16° *W.* This light will be exhibited annually from 1st August to 15th May.

106.—NORWAY.—*West Coast.—Buddybet.—Occulting Light, with Red and White Sectors on Inner Harö.*—With reference to notice in 1889, on the intended exhibition of a light of small power, and not to be constantly watched, on inner Harö, Buddybet, west coast of Norway; on 1st January, 1890, the light would be exhibited. The light is an *occulting* light, with *red* and *white* sectors; it shows *red* between the bearings of S. 20° E. and S. 36° E., covering Oddene; *white* between S. 36° E. and S. 48° E., or from southward of Oddene to northward of Skierlingflu; *red* between S. 48° E. and S. 75° E., or from northward of Skierlingflu to southward of Svansholm; and *white* from S. 75° E., through east, to N. 28° W. The light is elevated 55 feet above the sea, and visible from a distance of 6 miles. The lighthouse is 10 feet high. Position, lat. 62° 52′ 45″ N., long. 6° 56′ 45″ E. *Variation*, 16° *W.* This light is exhibited annually from 1st August to 15th May.

107.—SPAIN.—*North Coast.—Bilbao Bay.—Buoys Marking Extremity of Breakwater in Course of Construction.*—On 9th December, 1889, the foundations of the breakwater in course of construction on the western side of Bilbao bay, extended about 550 yards N.E. by E. ¾ E., from a position on the coast, 275 yards south-eastward of Cuartas point. The extremity of the works is marked by buoys, which are moved seaward as the breakwater advances. *Variation*, 17° *W.*

108.—MEDITERRANEAN.—*Italy.—West Coast.—Naples Roads.—Light on San Gennaro Mole, and Alteration in Light on Western Head of Eastern Mole.*—On 3rd January, 1890, a light was exhibited from the northern extremity of San Gennaro mole, Naples roads. It is a *flashing green* light, showing a *flash* every *five seconds*. Position, lat. 40° 50′ 22″ N., long. 14° 15′ 40″ E. Also, with reference to Notice 63, p. 158, on the exhibition of a fixed *red* light from the centre of the western head of the eastern mole, Naples roads; by Notice dated 7th January, 1890, the following alteration has been made in this light:—The lights are

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two fixed red lights, placed vertically. Position, lat. 40° 50′ 20″ N., long. 14° 16′ E.

109.—MEDITERRANEAN.—*Grecian Archipelago.—Levitha Island. —Lights on Spano Point.*—With reference to notice in 1889, on the intended exhibition of two lights on Spano point, eastern extreme of Levitha island, on 20th February, 1890, the lights will be exhibited. The lights on Spano point will be *fixed white* lights, placed vertically, the upper light elevated 131 feet above the sea, and visible from a distance of 10 miles. Position, lat. 37° 0′ N., long. 26° 31¼′ E.

110.—MEDITERRANEAN.—*Grecian Archipelago.—Channel of Mityleni.—Gymno Island.—Lights on Ali Point.*—Also, with reference to notice in 1889, on the intended exhibition of two lights on Ali point, eastern extreme of Gymno island, on 20th February, 1890, the lights will be exhibited. The lights on Ali point will be *fixed red* lights, placed vertically, the upper light elevated 65 feet above the sea, and visible from a distance of 6 miles. Position, lat. 39° 17′ N., long. 26° 37¼′ E.

111.—RED SEA.—*Western Shore.—North Musawwa Channel.— Light on Difneïn Island.*—With reference to notice in 1887, on the intended exhibition of a light on Difneïn island, &c., eastern side of entrance to North Musawwa channel, on 26th December, 1889, the light was exhibited from a lighthouse recently erected on the N.E. point of Difneïn island. It is a *fixed white* light, visible through an arc of 295°, or between the bearings of N. 46° W., through east, and S. 69° W., elevated 62 feet above the sea, and should be seen from a distance of 6 miles. The lighthouse, 33 feet high, is the shape of a truncated pyramid with a quadrangular base, constructed of wood, and painted white. Position, lat. 16° 37′ 10″ N., long. 39° 18′ 45″ E. *Variation*, 4° *W.*

112.—CANARY ISLANDS.—*Gran Canaria.—Light near Maspalomas Point.*—With reference to notice in 1889, on the intended exhibition of a light from a lighthouse erected near Maspalomas point, south extreme of Gran Canaria, on 1st February, 1890, the light would be exhibited. The light on Maspalomas point is a *fixed white* light of the first order, visible seaward from the bearing of S. 71°E. to W., elevated 190 feet above H.W., and should be seen from a distance of

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about 20 miles. The lighthouse, 187 feet high and constructed of stone, consists of a tower, cylindrical in shape and of a blueish gray colour, rising above a rectangular building; it is situated 49 feet from H.W. mark, and 131 feet from L.W. mark. Approximate position on Admiralty charts, lat. 27° 43′ 50″ N., long. 15° 35′ W. *Variation*, 19° *W.*

113.—Cape Verde Islands.—*St. Nicholas.—St. George Bay.—Rolla Road.—Lights at Preguiza.*—On 1st January, 1890, the following lights were exhibited at Preguiza, Rolla road, southern shore of St. Nicholas :—(1.) A *fixed white* light, visible over the anchorage, is shown from the flagstaff near the fort; it is elevated 128 feet above the sea, and should be seen from a distance of about 9 miles. Position, approximate, lat. 16° 34½′ N., long. 24° 16′ W. (2.) A *fixed red* light is shown from an iron post in the middle of the central quay; it is visible from a distance of about 2 miles.

114.—Africa.—*South Coast.—Knysna Harbour.—Signal and Pilot Station on Outer Obelisk Point.*—A pilot-house has been erected on the summit of Outer Obelisk point, eastern side of entrance to Knysna harbour. The house, 17 feet high, is square in shape and painted white; it is visible from a considerable distance seaward, and is a good landmark for the entrance of the harbour. Position, lat. 34° 4′ 50″ S., long. 23° 4′ 4″ E. Also, on the 1st January, 1890, the signal-staff, hitherto on the summit of Inner Obelisk point, would be removed to the above pilot-house, which would then become the signal station for Knysna harbour.

115.—Africa.—*East Coast.—Northern Approach to Zanzibar.—Non-Existence of Reported Bank.*—With reference to notice in 1889, on a reported bank, on which soundings of 8 to 9 fathoms were obtained, in the northern approach to Zanzibar, situated with Mungopani lighthouse bearing N. 20° E., distant about 4½ miles; an examination of the locality has recently been made by Lieutenant and Commander A. F. Balfour, H.M. surveying-vessel *Stork*, with the following result :—No indication of a bank could be found, soundings of 17 fathoms being obtained on and around the reported position of the bank. This bank has consequently been expunged from the Admiralty charts. *Variation*, 10° *W.*

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116.—GULF OF ADEN.—*North Shore.—Aden Harbour.—Permanent Light-Vessel to be Replaced in Position.*—With reference to notice in 1889, that the light-vessel moored off Ras Marbút, Aden harbour, would be withdrawn for repairs, and replaced by a provisional light-vessel; on 15th February, 1890, the provisional light-vessel would be replaced by the permanent light-vessel. The light will be (as previously) a *flashing white* light, showing a flash *every minute*, and elevated 39 feet above the sea. The light-vessel, moored in 18 feet at L.W., is painted red, but will not carry a red ball at the masthead, nor hoist a red flag during the day.

117.—CEYLON.—*South Coast—Unsuccessful Search for Shoal Ground South-Westward of Great Basses.*—Information having been received from Lieutenant A. Channer, R.N., that during the strength of the S.W. monsoon in 1889, the light-keeper at Great Basses had reported that he saw the sea break, about 6 miles distant, on a S.W. or S.W. by W. bearing, from Great Basses lighthouse, south coast of Ceylon; also that the master of the steam-vessel *Clan Drummond* had reported that in the S.W. monsoon of 1888, he had seen the sea break near that position, or about where a depth of 14 fathoms is marked on the Admiralty chart. An examination of the locality has been made by Commander R. F. Hoskyn, R.N., in charge of the marine survey of India, with the following result:—Depths of 29 to 31 fathoms were obtained between the bearings of S.W. ½ S. and S.W. by W., and distances of from 4 to 8 miles, from Great Basses lighthouse. No indications of shoal water were found, the bottom being mostly sand or coral; but enough soundings were not taken to disprove the possible existence of a rock. The whole of that neighbourhood is covered with swirls and eddies, caused apparently by the current sweeping past Great Basses, and Commander Hoskyn has no doubt that in a moderate breeze the sea would break in many places. *Variation*, 2° *E.*

118.—CEYLON.—*S.W. and South Coasts—Light on Barberyn Island.*—With reference to previous notices on intended exhibition of a light from a lighthouse on Barberyn island, S.W. coast of Ceylon, on 8th February, 1890, the light was exhibited. The light on Barberyn island is a *flashing white* light, showing a quick

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flash *every minute*, elevated 150 feet above the sea. Position, lat. 6° 27¾′ N., long. 79° 57¾′ E.

(2.) *Light on Dondra Head.*—With reference to previous notices on intended exhibition of a light from a lighthouse on Dondra head, southernmost point of Ceylon, on 8th February, 1890, the light was exhibited. The light on Dondra head is a *flashing white* light, showing a quick flash *every twenty seconds*, elevated 150 feet above the sea. Approximate position, lat. 5° 55½′ N., long. 80° 35½′ E.

119.—Strait of Malacca.—*Eastern Shore.—Larút River.—Beacon Lights.*—On 1st December, 1889, two lights would be exhibited from beacons in Larút river, eastern shore of Malacca strait. They are *red* lights. One light is shown from the beacon at the entrance of the river, situated with Tanjong Krang lighthouse bearing N. by W. ½ W., distant 1⅛ mile. Position, lat. 4° 47′ N., long. 100° 31½′ E. One light is shown from the beacon at the junction of the Larút and Sapetang rivers. Position, lat. 4° 47¾′ N., long. 100° 36′ E. *Variation*, 3° *E.*

120.—Eastern Archipelago.—*Java.—North Coast.—Batavia.—Western Approach.—Intended Alterations in Lights.*—On 1st March, 1890, the following alterations will be made in the lights, western approach to Batavia:—(1.) A light of the fifth order will be exhibited from Babi island; position, approximate, lat. 5° 48½′ S., long. 106° 16′ E. (2.) A light of the fifth order will be exhibited from Payung island; position, approximate, lat. 5° 49½′ S., long. 106° 33′ E. (3.) The light (*fixed white*) on Merak island will be discontinued; position, lat. 5° 56½′ S., long. 105° 58½′ E. (4.) The light (*fixed white*) on Great Kombuis will be discontinued; position, lat. 5° 55½′ S., long. 106° 34¾′ E.

121.—Eastern Archipelago.—*Java.—Madura Strait.—Alterations in Light on Zwantyes (Koko) Reef.*—The following alterations have been made in the light exhibited from Zwantyes (Koko) reef, Madura strait, eastern coast of Java:—It is a *flashing white* light, showing a *flash* every *thirty seconds*. Illuminating apparatus, of the fourth order. In other respects this light is unchanged. Position, lat. 7° 28′ S., long. 113° 7′ E.

122.—China Sea.—*Strait of Makassar.—Sand Cay South-Eastward of Balabalágan (Little Paternoster) Islands.*—Mr. A. C. Cooke,

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commanding the steam-vessel *Byron*, reports the existence of a sand cay, situated south-eastward of Balabalágan (Little Paternoster) islands, south-western part of Makassar strait. This cay is about 4 feet above water, composed of white sand, and appeared to be about 500 yards in diameter. On 2nd December, 1889, Balabalágan bearing from the *Byron* N.E. by N., and Semángil N.W. by W., the cay was in line with Semángil, and distant about 3 miles from the ship. Position of sand cay, from the above, lat. 2° 36′ S., long. 117° 51′ E. *Variation* 2° E.

123.—Sulu Sea. —*Philippine Islands. — Basilan Strait.—Reef Reported in Fairway.*—Mr. J. G. Park, commanding the ship *Luzon*, has reported that when passing through Basilan strait, the vessel touched on a coral reef, the bottom being seen. The reef in Basilan strait, with 21 feet on it, lies with the following mark and bearing :—Samboanga just open eastward of Santa Cruz (Great) island; north end of Lanhil island E. Approximate position, lat. 6° 47½′ N., long. 122° 4½′ E. *Variation*, 2° *E.*

124.—Japan. — *Sikok.—South Coast.—Nomi Harbour.—Foul Ground Southward of Kogi Saki.*—Foul rocky ground extends for a distance of 1½ cable in a S. by E. direction from Kogi saki, northern side of entrance to Nomi harbour. A rock with 5 feet on it at L.W. spring tides, lies at the southern extreme of this foul ground, with the following bearings :— Nomi saki, E.N.E.; Kadoya saki, in line with Maru saki, W. by N. ¾ N.; Kogi saki, N. ¼ W.

Note.—The western point on the northern side of the entrance to the harbour is named Maru saki; the point 2 cables eastward, Kogi saki; and the point southward of Nomi village, Nomi saki. On the south side of the harbour, the point about 4 cables north-eastward of Hey Sima is named Onaga sima ; and the point 4 cables further north-eastward, Konaga sima. *Variation*, 4° *W.*

125.—Australia.— *North Coast. — Bathurst Island. — West Coast.—Sunken Rock Westward of Cape Helvetius.*—Information of the existence of a sunken rock off cape Helvetius, west coast of Bathurst island, on which the schooner *Wanganui* recently struck. The position given for the rock (*Wanganui rock*) is with cape Helvetius bearing E. by S. distant 8 miles. The depth on the rock

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is probably less than 6 feet. As the distance of this rock from the land depends upon estimation its position is very doubtful. Position, approximate, lat. 11° 40′ S., long. 129° 56′ E. *Variation*, 2° *E.*

Note.—The attention of mariners is directed to the Cautionary Note on the chart in this neighbourhood, and they are recommended not to approach the coast between cape Fourcroy and cape Helvetius within a distance of 8 miles, until further examination shall have been made.

126.—AUSTRALIA.—*East Coast.—Inner Route.—Sunken Rock and Bank Eastward of Claremont No. X. (Chapman) Island.—Non-Existence of Rock Awash South-Eastward of Young Island.*—Information relating to dangers found in the Inner route, east coast of Australia, the result of recent examinations by Commander G. C. Frederick, H.M. surveying-vessel *Dart*:—

(1.) A sunken rock, composed of coral, with a depth of 5 feet on it at L.W., is situated with Claremont No. X. (Chapman) island bearing W.S.W., distant $1\frac{9}{10}$ths mile. Position, lat. 12° 53′ S., long. 143° 39′ 15″ E.

(2.) A bank, with several patches of 2½ fathoms near its western edge, extending thence more than a mile to the eastward, with patches of 4 and 5 fathoms on it, lies between the above rock and Claremont No. X. island. From the shoalest part of this bank Claremont No. X. island bears W. by S., distant 8 cables.

(3.) A careful search was made for the rock awash at L.W., marked on the charts in a position bearing S.E. distant $1\frac{3}{10}$ths mile from Young island. Depths of 12 to 14 fathoms, and a level bottom, were found all round and upon the assigned position of this rock; and at L.W., and under favourable circumstances no indications of shoal water were observed in the locality. This rock has consequently been expunged from the Admiralty charts. Position, lat. 12° 8′ 30″ S., long. 143° 14′ E. *Variation*, 5° *E.*

127.—AUSTRALIA.—*East Coast.—Princess Charlotte Bay.—Amended Position and Particulars of Taiwan Shoal.*—With reference to notice in 1888, on the amended position of the shoal on which the steam-vessel *Taiwan*, drawing 19 feet, was reported to have struck, lying midway between e and g reefs, Princess

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Charlotte bay, the following particulars of Taiwan shoal were obtained in a recent examination of the locality by H.M. surveying-vessel, *Dart*:—This shoal, which is nearly circular, is about 1¼ cable in diameter, with the least depth (17 feet at L.W. springs) situated near the centre; thence the water gradually deepens to the 5 fathoms line, whence it drops more suddenly to a depth of 9 and 10 fathoms, which is the average depth near. From the depth of 17 feet the beacon on g reef bears N. ¼ E., distant 1¼ mile; and f sand beacon, W. ½ S. Position, lat. 14° 3′ 45″ S., long. 143° 57′ 50″ E. An examination of the last assigned position of Taiwan shoal, as given in the above-mentioned notice, viz., with the beacon on e reef bearing W. by S., distant 1⅓ mile was made; but no shoal casts were obtained, nor were any indications of shoal or discoloured water seen in the vicinity. *Variation*, 5° *E.*

128.—Australia.—*East Coast.—Turtle Group.*—(1.) *Particulars of Gunga Shoal.*—Gunga shoal consists of a small coral knoll, steep-to around, with a least depth of 7 feet on it, lying with the following bearings:—Highest tree on N. islet, N. 54° E.; North Turtle islet centre, S. 20° E., distant $1\frac{3}{10}$ths mile; S.W. Turtle islet centre in line with North Sand hill, S. 15° W. Position, lat. 14° 41′ 10″ S., long. 145° 14′ 0″ E.

(2.) *Reef N.W. of Gunga Shoal.*—A coral reef lies about 1¼ mile north-westward of Gunga shoal, Turtle group. A reef, of small extent and steep-to around, with 9 feet water on it, is not easily distinguished until close to in consequence of the water in the vicinity being frequently much discoloured by sand and fish spawn; it lies with the following bearings:—Highest tree on N. islet, N. 66° E.; North Turtle islet centre, S. 45° E., distant 2¼ miles; S.W. Turtle islet centre, S. 5¼ E. Position, lat. 14° 40′ 40″ S., long. 145° 12′ 40″ E. *Variation*, 6° *E.* The depths given are at L.W. spring tides.

129.—Australia.—*East Coast.—Reef Eastward of Lookout Point.*—Lieutenant and Commander G. C. Frederick, H.M. surveying-vessel *Dart*, reports the existence of a coral reef lying about 3¼ miles eastward of Lookout point. A reef, of small extent, and steep-to around, with 13 feet water on it, not easily distin-

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guished until close to, unless the current is strong, when ripples will show its position, lies with the following bearings and distance:—Beacon on No. 1 reef, S. 31° W., distant 2 miles; Lookout point summit, S. 77° W. Position, lat. 14° 49′ 30″ S., long. 145° 19′ 15″ E. *Variation*, 6° *E.*

130.—Australia.—*East Coast.—Moreton Bay.—Howe or North Channel.—Intended Alteration in the Positions of Certain Lighthouses.*—With reference to Notice 80, p. 163, on the farther westerly extension of East bank, eastern side of Howe or North channel, Moreton bay, in consequence of the continued extension westward of East bank, it is intended about the middle of January, 1890, to alter the position of Tangaluma lighthouse, so that kept in line with Cowan Cowan lighthouse, will give a new line of direction for Howe or North channel. Also, to alter the position of Yellow Patch lighthouse, so that kept in line with cape Moreton lighthouse, it will indicate the northernmost point at which Tangaluma and Cowan Cowan lighthouses in line should be used. The old Yellow Patch lighthouse will for a time be left in its present position. Further notice will be given.

131.—New Zealand.—*Middle Island.—West Coast.—Thompson Sound and Doubtful Inlet.—Secretary Island.—Sunken Rock off Common Head.*—The master of the s.s. *Omapere* has reported that when proceeding from Thompson sound to Doubtful inlet, the vessel (drawing 12¼ feet water) struck on a sunken rock, the position of which is uncertain, no bearings having been taken. The position of the rock in the passage between Secretary island and Wood head was estimated to be a little more than one-third of the distance from Common head (the S.E. extreme of Secretary island) to *Seymour islet* (situated about 5 cables northward of Wood head). After the vessel struck, search was made for the rock in a boat, but it could not be found, probably therefore it is a pinnacle of small extent. Approximate position, lat. 45° 18¾′ S., long. 167° 0½′ E., and marked P.D. on charts.

132.—New Caledonia.—*South Coast.—Lights at Port Noumea.*—On 15th October, 1889, the following lights were exhibited at port Noumea, south coast of New Caledonia:—

(1.) A *fixed white* light is exhibited from Ducrot summit, north-

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eastward of Lallemand cove, southern side of Dubouzet (Nu) island. It is visible through an arc of 8°, or between the bearings of N. 18° W. and N. 26° W., in the channel between I. aux Canards (Mando) and I. Maitre (Ieroi); and is elevated 230 feet above the sea. Position, lat. 22° 16′ 20″ S., long. 166° 25′ 50″ E.

(2.) Two leading lights, *fixed red*, are exhibited from the northern side of Uerendi (Pointe de l'Artillerie), southern side of port Noumea. These lights in line, bearing N. 52° E., lead through Little Entrance, midway between the northern point of De Brun island and the buoy southward of Denouel point. The upper (rear) of these lights is not visible in port Noumea eastward of the bearing S. 38° E.

(3.) A *fixed red* light is exhibited from the eastern side of Denouel point, visible through an arc of 132°, or between the bearings of N. 23° W. and S. 25° W.

Note.—Having passed through Bulari passage, and south-eastward of Four Western banks, the light on Ducrot summit, Dubouzet (Nu) island should be steered for on a N. 22° W. bearing, and kept on that bearing until the leading lights on Uerendi are in line, bearing N. 52° E.; pass through Little Entrance with these leading lights in line, and when the light on the Eastern part of Denouel points opens out, bearing N. 23° W., course should be altered to about N. by E. for the anchorage; which will be reached when the light on the eastern part of Denouel point, and the rear leading light on Uerendi becomes obscured. The exact positions of these lights are doubtful. *Variation*, 10° *E.*

133.—North Pacific.—*Sandwich Islands.—Oahu.—Honolulu Harbour.—Time-Signal at Planing Mill.*—Lieutenant R. G. Davenport, of the United States vessel-of-war *Nipsic*, reports that a time-signal has been established at the Honolulu steam-planing mill, Honolulu, Sandwich islands. The signal is a whistle, which is sounded twice daily by electric signal from the survey office; first, at noon Honolulu mean time, equivalent to 10h. 31m. 27·5s. Greenwich mean time; secondly at 1h. 28m. 32·5s. p.m. Honolulu mean time, equivalent to 12h. 0m. 0s. Greenwich mean time.

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134.—North America.—*U.S. Pacific Coast.—California.—San Francisco Harbour.—Oakland Harbour Entrance.—Light, with Fog-Signal, Westward of North Jetty.*—On or about 25th January, 1890, a light would be exhibited from a lighthouse recently erected in a depth of about 10 feet, about one cable westward of the extremity of Oakland harbour north jetty, entrance to San Antonio creek, eastern side of San Francisco harbour. It is a *fixed white* light, elevated 43 feet above H.W., and visible from a distance of 12 miles. Illuminating apparatus of the fifth order. The light-house, constructed of wood, and painted white, with a brown roof, is surmounted by a black lantern, and stands on a foundation of piles. Position, lat. 37° 47′ 55″ N., long. 122° 19′ 55″ W. Also, in this lighthouse, during thick and foggy weather, a bell will be struck by machinery *every twenty seconds.*

135.—North America.—*U.S. Pacific Coast.—California.—Buchon Point.—Automatic Signal-Buoy Withdrawn.*—With reference to notice in 1889, that an automatic signal (whistle) buoy had been placed south-westward of Buchon point, northward of San Luis Obispo bay, approximate position, lat. 35° 13′ N., long. 120° 54′ W.; by further notice, this whistle-buoy has been withdrawn.

136.—North America.—*U.S. Pacific Coast.—Oregon.—Fog-Bell at Warrior's Rock Light-Station, Columbia River.*—A fog-bell has been established at Warrior's rock light-station, near the end of Warrior's point, about one mile above Saint Helen, Columbia river. During thick and foggy weather the bell will be struck by machinery a single blow every 15 seconds.

137.—North America.—*U.S. Pacific Coast.—Oregon.—Columbia River Entrance.—Alterations in Buoyage.*—With reference to notice in 1888, on two buoys, Nos. 1 and 1½, having been placed near the bar, Columbia river entrance, to mark the channel over the Middle sands, by further notice, dated 18th January, 1890, the two under-mentioned buoys have been placed on the bar, Columbia river entrance, to mark the channel over the Middle sands, and buoys, Nos. 1 and 1½, previously marking the old channel, have been withdrawn :—

(1.) *Outer Buoy*, first-class *can*, painted black and white in

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vertical stripes, with the letters M.S. in white on it, is moored in 10 fathoms at L.W., with the following bearings:—Cape Disappointment lighthouse, N. 25° E.; Adam's point lighthouse, N. 88° E., distant 8½ miles.

(2.) *Inner Buoy*, first-class *nun*, painted black and white in vertical stripes, is moored in 4 fathoms at L.W., with the following bearings:—Cape Disappointment lighthouse, N. 19° E.; Adam's point lighthouse, S. 85° E., distant 8 miles. This channel should not be attempted by strangers. Peacock spit buoy, No. 3, that previously marked the old channel into Baker bay, has been withdrawn. *Variation*, 22° *E.*

138.—South America.—*Magellan Strait—Broad Reach.—Sandy Point Road—Doterel Wreck Buoy not in Position.*—Commander C. T. Turner, H.M.S. *Nymphe*, reports 28th December, 1889, that the buoy marking the wreck of H.M.S. *Doterel* in Sandy point road was not then in position, having broken adrift a few days previously; but that the Captain of the Port informed him that it was hoped the buoy would shortly be replaced.

139.—South America.—*East Coast.—Rio de la Plata.—Unsuccessful Search for Reported Shoal Southward of Lobos (Sea Wolf) Island.*—With reference to notice in 1889, on the existence of a shoal with depths of 4¼ to 6¼ fathoms, reported to be situated with the south-eastern point of Lobos island (northern side of entrance to Rio de la Plata), bearing N. 29° W., distant about 2 miles. Captain Le Nepvou de Carfort, French vessel-of-war *Etoile*, has recently examined the locality with the following result:—Soundings of 17 to 18 fathoms were obtained, southward, south-eastward, and eastward of Lobos island, on and around the reported position of the shoal. It has consequently been marked P.D. on the Admiralty charts. *Variation*, 7° *E.*

140.—South America.—*East Coast.—Cape Frio.—Position of Signal Station.*—Captain K. A. Stakman Bosse, commanding the Netherlands vessel-of-war *Tromp*, reports that the signal station near cape Frio is situated on a hill, about 3 miles N. by W. of cape Frio lighthouse, near Nostra Sa. des Remedios. The signal station consists of a large white house, with a red roof, and a

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flagstaff on each side. Position, approximate, lat. 22° 57′ S., long. 42° 1′ W. *Variation*, 5° *W.*

Note.—No signals are now made from cape Frio lighthouse.

141.—South America.—*East Coast.—River Amazons.—River Pará.—Shoals South-Westward of Pinheiro Point, and Eastward of Goiabal Lighthouse.*—The master of the German steam-vessel *National* has reported the existence of two shoals, in the river Pará:—

(1.) A shoal, south-westward of Pinheiro point, on which the *National* grounded, 5th October, 1889, is situated with Pará cathedral in line with the western extreme of Nova island, bearing S. ¼ W.; and Tapaca, S.E. by E., distant $1\frac{3}{10}$ths mile. Position, lat. 1° 18¼′ S., long. 48° 30¼′ W.

(2.) A shoal, eastward of Goiabal lighthouse, which dries at L.W., for a distance of about 2½ cables east and west, steep-to on the northern side, with shoal ground extending about 8 cables westward and a greater distance southward from the dry part, is situated with Goiabal lighthouse bearing west, distance $3\frac{1}{10}$th miles, from the part which dries. Position, lat. 1° 37½′ S., long. 49° 7½′ W. *Variation*, 4° *W.*

142.—South America.—*River Amazons.—River Pará, and Western Branch.—Intended Lights on Joannes Point and Bailique Island.*—Information from the Amazon Steam Navigation Company; it is intended to exhibit lights from lighthouses to be erected on Joannes point, western shore of river Pará, and on Bailique island, west side of entrance to western mouth of river Amazons. Position, Joannes point, approximate, lat. 0° 51½′ S., long. 48° 31′W. Position, Bailique island, approximate, lat. 1° 0′ N., long. 49° 55′ W. Further particulars will be published.

143.—United States.—*New York.—Long Island Sound.—Oyster Bay.—Light, with Fog-Signal, Eastward of Centre (Hog) Island.*—On or about 31st January, 1890, a light will be exhibited from a lighthouse recently erected at the extreme of the shoal extending eastward from Centre island, western side of entrance to Oyster bay and Cold Spring harbour, south side of Long island sound. It will be a *fixed red* light, elevated 40 feet above H.W., and visible from a distance of 11 miles. Illuminating apparatus, of

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the fourth order. The lighthouse, constructed of wood, is square and pyramidal in shape, painted white; surmounted by a lantern, painted black, and stands on a black cylindrical foundation pier. It is situated with Centre island point bearing W. by N. ¾ N., distant $1\frac{3}{10}$ths mile; and N.W. bluff, N. ¼ W. Position, lat. 40° 54′ 50″ N., long. 73° 29′ 37″ W. Also, at this lighthouse, during thick or foggy weather, a bell will be struck by machinery *every thirty seconds.*

144.—United States.—*Massachusetts.—Boston Harbour.—Light Southward of Deer Island.*—On or about 25th January, 1890, a light would be exhibited from a lighthouse recently erected in a depth of about 6 feet, near the extreme of the spit extending southward from Deer island, northern side of Broad sound channel, Boston harbour. The light is a *fixed white* light, varied by a *red flash* every *thirty seconds*, visible through an arc of 237°, or between the bearings of S.W. by W. ⅞ W., through west, and S.E. by E. Elevated 52 feet above the sea, and should be seen from a distance of about 13 miles. Illuminating apparatus, of the fifth order. The lighthouse consists of a conical iron tower, painted brown, surmounted by a black lantern, and erected on a black cylindrical foundation pier. Position, lat. 42° 20′ 24″ N., long. 70° 57′ 18″ W. *Variation* 12° *W.*

Note.—This light must be left on the starboard-hand in entering Boston harbour.

145.—Bay of Fundy.—*River Petitcoudiac.—Intended Light on Folly Point.*—On 1st March, 1890, a light will be exhibited from a lighthouse recently erected on Folly point, at the junction of the rivers Petitcoudiac and Memramcook, head of bay of Fundy. It will be a *fixed white* light, elevated 77 feet above H.W., and visible from a distance of 14 miles. Illuminating apparatus, dioptric, or by lenses, and of small power. The lighthouse, 35 feet high, is square in shape, constructed of wood, and surmounted by an iron lantern; the lighthouse is painted white, and the lantern red. Position, lat. 45° 52′ 5″ N., long. 64° 33′ 52″ W.

146.—Nova Scotia.—*S.E. Coast.—Little Hope Islet Light.—Alteration in Character.*—With reference to Notice on an intended alteration in the character of the light exhibited on Little Hope

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islet; on 1st November, 1889, the alteration was carried out. It is a *group flashing white* light, showing *three flashes* with intervals of *ten seconds* between their points of greatest brilliancy, followed by an interval of *thirty seconds*, during the greater part of which interval the light will be totally eclipsed. Position, lat. 43° 48½′ N., long. 64° 47¼′ W.

147.—Newfoundland.—*S.W. Coast.—La Poile Bay.—Sunken Rocks Northward of Ireland Island, Eastward of Madman Island, and at Entrance of Little Harbour.*—Information from Staff-Commander W. F. Maxwell, R.N., in charge of the Newfoundland Survey:—

(1.) A sunken rock, with a depth of less than 6 feet on it, and on which the sea breaks, is situated with Ireland island lighthouse bearing about S. by W. ¾ W., distant 4 7/10ths cables; and North rock about N. by W. ½ W. Position, approximate, lat. 47° 38′ 15″ N., long. 58° 22′ 15″ W.

(2.) A sunken rock, with a depth of 2½ fathoms on it, and 4 to 5 fathoms close around, lies one cable N.N.E. from rock (1).

(3.) A sunken rock, with a depth of 2 fathoms on it, is situated with Ireland island lighthouse bearing about West, distant 2½ miles, and north-eastern extreme of Madman island about N. ¼ E. Position, approximate, lat. 47° 39′ 5″ N., long. 58° 18′ 55″ W.

(4.) A sunken rock (*Tooth rock*), with a depth of 2¾ fathoms on it, and 5 to 10 fathoms close round, lies at the entrance of Little harbour, with Gallyboy head bearing S.E. by E. ¾ E., distant 1¼ mile; and eastern extreme of Kennedy point, N.E. by E. Position, lat. 47° 40′ 50″ N., long. 58° 22′ 40″ W. *Variation*, 29° *W.*

148.—Gulf of St. Lawrence.—*Northumberland Strait.—Bay Verte.—Intended Light on Cold Spring Head.*—On the opening of navigation in the spring of 1890, a light will be exhibited from a lighthouse recently erected on Cold Spring head, southern side of bay Verte, south shore of Northumberland strait. It will be a *fixed white* light, elevated 60 feet above H.W., and visible, seaward, from a distance of 13 miles. Illuminating apparatus, dioptric, or by lenses, and of small power. The lighthouse, 36 feet high, is square in shape, and painted white, with the iron lantern surmounting it painted red. It is situated about 100 feet from the northern side of the head. Position, lat. 45° 58′ 5″ N., long. 63° 52′ W.

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OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,
18th February, 1890.

THE following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

NOTE.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
2117	Baltic Entrance, Kiel Bay: Sheet IV.	Numerous corrections throughout. January.
650	Africa, E.: Plans Innambán, Kilimán River	Militáo Channel, Kilimán River. November.
136	India: Bay of Bengal, River Húgli, Saugor point to Calcutta	New Chart. December.
1272	Bay of Bengal, E.: Tenasserim, approaches to Yé River ...	New Chart. November.
2660A	China Sea, Southern portion: Western Sheet	Malay Peninsula. December.
2062	China Sea: Tong King Gulf ...	Extensive corrections Tong King coast. January.
1124	China: Southern approach to Yang Tse Kiang, Video to Cape Yang Tse	New Chart. January.
1392	China: Pé-chili strait	Plan erased. November.
2405	Japan: Kuril Islands, Nipon to Kamchatka	Yezo Island, E. December.
1352	France, N.: Dunkerque Road	New Chart. February.
438	Ditto Boulogne: Cape D'Alprech to Ambleteuse	New Chart. February.
1367	Greece: Corinth Bay and Isthmus	New Chart. January.
234	Suez Canal: Port Said... ...	New Chart. February.
1394	Malay Penin., E.: Plans Entrance to Kuantan and Pahang River	New Chart. February.
1125	Australia, E.: Plans Gloucester passage and Port Newry ...	Port Newry, large corrections. January.
1246	North America, E.: Machias Seal I. to Gouldsborough Bay	New Chart. February.
1274	Florida, W.: Tortugas Cays to Cape San Blas	New Chart. January.
1393	South America, W.: Ecuador, Caracas River	New Chart. February.

Agent for the sale of Admiralty Charts, MR. J. D. POTTER, 31, *Poultry, London, E.C.*

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THE Life Saving Appliances Committee, Mr. Ismay, Chairman, met on Tuesday the 18th ultimo, at 8, Richmond Terrace, to consider certain suggestions in connection with the rules framed by that Committee. An influential Deputation of Shipowners and others connected with the Short Sea and Coasting Services was introduced by Mr. John Burns, with a view of representing their views on the application of the Rules to the Committee.

THE Board of Trade have received through the Foreign Office, a silver medal and diploma, which have been awarded by the Italian Government to Mr. David Evans, master of the ship *Kaffir Chief*, of Yarmouth, in recognition of his services in rescuing the ship-wrecked crew of the brigantine *Ottone*, of Genoa, which was abandoned 230 miles from Pernambuco, on the 7th September last.

THE Board of Trade have received through the Foreign Office the undermentioned rewards which have been granted by the Italian Government to the crew of the British s.s. *Brooklyn City*, of Bristol, in recognition of their services in rescuing the crew of the Italian brigantine *Barone Podesta*, on the 13th September, 1889:—Silver medals to William Fitt, master, and William French, mate; and bronze medals to John Goddard, boatswain, and William Yea, Frank Walter, Carl Jakobson, Alfred Amundsen, and Thomas Cook, seamen.

OFFICIAL INQUIRIES AT HOME, 1890.

3967. *Benjamin Whitworth*, s.s.; built at Middlesbrough, 1871; owned by Mr. T. Wilson and others; tonnage, 638; Copenhagen to Gefle; ballast; stranded on Stenbadar Rock, Aland Islands, November 2, 1889. Inquiry held at Cardiff, January 9, 1890, before Lewis, Judge; Cosens and Bain, N.A. Stranding due to master mistaking a light on the Aland Islands for Understen light on Swedish side of channel. Certificate suspended for three months.

3968. *General Picton*, barque; built at Sunderland, 1884; owned by Mr. T. Morris and others; tonnage, 1,198; Garston to Iquique; coal; abandoned on fire off Cape Horn, September 14, 1889.

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Inquiry held at Liverpool, January 11, 1890, before Raffles, Judge; Castle and Davies, N.A. Loss owing to spontaneous combustion of cargo of coal.

3970. *Cerdic*, s.s.; built at Stockton, 1884; owned by Durham Steamship Company, Limited; tonnage, 1,313; Mosse to the Tyne; ballast; stranded at Cresswell, Northumberland, December 24, 1889. Inquiry held at North Shields, January 18, 1890, before Stevenson and Morrison, Justices; Methven and Hore, N.A. Stranding caused by master trusting entirely to dead reckoning, and insufficiently using the lead. Certificate suspended for three months.

3972. *Cherwell*, barque; built at Middlesbrough, 1864; owned by Mr. E. P. Bates and others; tonnage, 1,129; Pisagua to Queenstown; saltpetre; stranded at Three Castle Head, Co. Cork, December 30, 1889, when two lives were lost. Inquiry held at Liverpool, January 22, 1890, before Raffles, Judge; Parish, Curme and Richardson, N.A. Stranding due to the neglect of the lead. Master censured.

3973. *Merannio*, s.s.; built at West Hartlepool, 1881; owned by Mr. D. Marshall and others; tonnage, 609; Cardiff to Copenhagen; coal; stranded near Hirtshals Light, Jutland, November 16, 1889. Inquiry held at Edinburgh, January 28, 1890, before Rutherfurd, Judge; Ward and Parfitt, N.A. Stranding due to the neglect of the lead. Certificate of master suspended for three months.

3974. *Karoon*, s.s.; built at West Hartlepool, 1859; owned by Mr. T. Appleby and others; tonnage, 1,422; Savannah to Bremerhaven; cotton; stranded on the Haaks, Holland, December 9, 1889. Inquiry held at Middlesbrough, January 23, 1890, before Coleman, Judge; French and Bragg, N.A. Casualty caused by the courses said to have been steered not having been made, and through soundings having been neglected. Master censured.

3975. *Ringwood*, s.s.; built at Howden, 1889; owned by Mr. H. James; tonnage, 540; Amble to London; coal; stranded near Redcliffe, Yorkshire, December 31, 1889. Inquiry held at Westminster, January 23, 1890, before Marsham, Judge; Ronaldson and Cosens, N.A. Stranding due to vessel not making good the course

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set, and to master continuing at full speed in thick weather and neglecting the lead. Certificate suspended for three months.

3978. *Dragonfly*, s.s.; built at West Hartlepool, 1883; owned by Mr. A. D. Screna; tonnage, 1,134; Taganrog to Amsterdam; rye; stranded on the Haaks, Holland, December 9, 1889. Inquiry held at Cardiff, January 24, 1890, before Lewis, Judge, Davies and Brooks, N.A. Stranding owing to error of judgment of master in not making due allowance for tides, currents and leeway,

3980. *Beechdale*, barque; built at Liverpool, 1877; owned by Mr. W. Pentreath and others; tonnage, 792; Havana to New York; ballast; stranded at Point Look-out, Long Island, November 19, 1889. Inquiry held at Liverpool, January 27, 1890, before Raffles, Judge; Wilson and Cuninghame, N.A. Casualty caused by master's over confidence in his dead reckoning, allowance having been made improperly for the S.W. current. Certificate not dealt with.

3981. *Newnham*, s.s.; built at Jarrow, 1880; owned by Mr. J. Temperley, Junr., and others; tonnage, 1,268; Savannah to Bremerhaven; cotton; stranded on the North Haaks, Holland, December, 18, 1889. Inquiry held at Sunderland, January 28, 1890, before Booth and Stokoe, Justices; Castle and Bain, N.A. Stranding owing to master having been misled by incorrect soundings.

3983. *Dunrobin*, s.s.; built at Bowling, 1885; owned by Mr. W. E. Davies; tonnage, 151; from Barrow with pig iron; stranded near Laxey Harbour, Isle of Man, December 22, 1889. Inquiry held at Glasgow, January 21, 1890, before Guthrie, Judge; Baker and Brooks, N.A. Stranding owing to master continuing at full speed in thick weather after having run his distance to the Bahama lightship without seeing it, and neglecting to use the lead. Certificate suspended for three months.

3987. *Fernbrook*, s.s.; built at West Hartlepool, 1883; owned by Mr. J. Foster and others; tonnage, 1,099; Belfast to Cardiff; ballast; stranded at the Foreland, Bristol Channel, November 18, 1889. Inquiry held at Glasgow, January 29, 1890, before Lees, Judge; Hore and Baker, N.A. Stranding owing to a wrong course having been set and steered. Master and mate censured.

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3988. *John Adamson*, s.s.; built at Sunderland, 1872; owned by Mr. J. Westoll and others; tonnage, 1,090; Sunderland to Salonica; coal; stranded off Island of Psathura, Gulf of Salonica, November 24, 1889. Inquiry held at Sunderland, February 8, 1890, before Potts and Doxford, Justices; Parish and Ward, N.A. Stranding caused by master mistaking island of Jura for Psathura, and making no allowance for current; and by second mate continuing at full speed towards the land which was in sight on either bow. Certificate of latter suspended for three months.

3989. *Tunbridge*, s.s.; built at Middlesbrough, 1889; owned by Temperley Steam Shipping Company, Limited; tonnage, 1,526; Blyth to Alexandria; coal; stranded near Cape Villano, Spain, January 10, 1890. Inquiry held at Newcastle, February 6, 1890, before Nelson and Philipson, Justices; Methven and Anderson, N.A. Standing caused by error of compasses which the master had no opportunity of discovering.

Inquiry by Inspector, 1890.

84. *Earnmoor*, s.s.; built at Jarrow, 1887; owned by Earnmoor Steamship Company, Limited; tonnage, 1,819; Baltimore to Rio; wheat; went on her beam ends and foundered in lat. 25° N., long. 70° W., September 5, 1889, whereby nineteen lives were lost. Inquiry held at London, January 16, 1890, before Cuninghame, Inspector. Loss caused by vessel not having sufficient stability owing to her empty ballast tanks which occupied one-seventh of depth of ship and contained 11,620 cubic feet.

Official Inquiries Abroad, 1889.

3969. *British Monarch*, barque; abandoned on fire in lat. 37° 58′ S., long. 5° 2′ E., November 29, 1889. Inquiry held at Cape Town, December 11, 1889. Fire probably originated in some cases of matches stowed amongst the cargo.

3971. *Warrego*, s.s., and *Alice*, s.s.; in collision in Brisbane River, October 26, 1889. Inquiry held at Brisbane, November 22, 1889. Collision owing to vessels proceeding at too great a speed

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in a shallow cutting, and to *Alice* continuing at full speed when overtaken.

3976. *Otago*, barque; vessel damaged, and two lives lost, at sea, August 24, 1889. Inquiry held at Christchurch, N.Z., November 14, 1889. Casualty due to stress of weather, but vessel was ill found when she left Sydney.

3977. *Arawatta*, s.s.; stranded on Diamond Spit, Lamu, November 29, 1889. Inquiry held at Lamu, December 4, 1889. Casualty attributable to wrong soundings called by leadsman.

3979. *King Robert*, ship; abandoned on fire off Cape Horn, November 8, 1889. Inquiry held at Valparaiso, December 13, 1889. Casualty owing to spontaneous combustion of cargo of coal.

3982. *Alexandra*, barque; wrecked when loading off Rethymo, December 19, 1889. Inquiry held at Suda Bay, December 26, 1889. Casualty owing to master remaining anchored in the existing state of the weather.

3984. *Nylghau*, ship; stranded on Pratas Shoal, China Sea, November 25, 1889, and seven of her crew are missing. Inquiry held at Hong Kong, December 16, 1889. Casualty owing either to the master's observations placing ship too far to the S.E., or to vessel having experienced a W.N.W. set.

3985. *Polly*, s.s.; stranded in Johnstone River, November 17, 1889. Inquiry held at Geraldton, W.A., November 22, 1889. Loss owing to master neglecting to take a pilot, and proceeding at full speed up the river.

3986. *Osprey*, cutter, and *Wawoon*, s.s.; in collision in Fitzroy River, November 22, 1889. Inquiry held at Rockhampton, November 28, 1889. Collision owing to the bad look-out on *Wawoon*. Master censured, and ordered to pay costs, £15 15s.

3990. *Kinsembo*, s.s.; stranded on Carpenter Rock, December 27, 1889. Inquiry held at Freetown, Sierra Leone, January 8, 1890. Stranding due to mate not seeing that the course set by master was steered. Certificate suspended for six months.

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NAUTICAL GOSSIP AT HOME AND ABROAD.

THE importation of petroleum in bulk is increasing, and amongst other countries Holland is taking part in the new departure. It is imported principally at three ports, viz., Amsterdam, Rotterdam, and Flushing. In the first two ports tanks have been erected, and at Flushing a tank is being constructed to hold 13,000 barrels. During last year petroleum equal to 673,963 barrels was imported in Rotterdam and Flushing, as against 467,936 barrels in the previous year, but at Amsterdam there is a slight falling off.

A TANK transport system is being adopted for the interior of Germany by importers of American petroleum. The tank-waggons are of ten tons (seventy barrels) capacity. The petroleum is run into them at Geestemünde through pipes laid from the vessel, and the waggons go by rail *viâ* Bremen to Ruhort, when the petroleum is discharged into barrels for retail customers.

SOME idea of the importance of German steam-ship companies will be formed from the mileage performed by the vessels of the Norddeutsche Lloyd. According to an official table these are as follows :—

Bremen to New York	... ...	726,000 miles.
,, Baltimore	... ...	300,000 ,,
,, South America	... ...	550,000 ,,
,, East Asia	... ...	300,000 ,,
,, Australia	... ...	340,000 ,,
Hong Kong to Japan	... ...	44,000 ,,
Sydney to Samoa...	... ...	65,000 ,,
Brindisi to Port Said	... ...	48,000 ,,

ACCORDING to the Berlin correspondent of our contemporary *Industries*, the German Government have determined to construct a canal between Berlin and the Baltic. Herr Scheck has been asked to make surveys, &c., at the Stettin end of the

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canal, which is intended to be of such dimensions as to accommodate the largest sea-going vessels.

THE Portuguese government have ordered five torpedo boats from Herr Schichau, of Elbing. Have these orders been lost to British firms by the strained relations between the British and Portuguese Governments?

THE Hague is likely to become a seaport town if the proposal to construct a maritime harbour at Scheveningen be carried out. It will be constructed at the mouth of the fresh-water canal with a pier for steamers, protected by two moles projecting 950 metres into the sea. These moles will form an entrance from the sea 110 metres wide. An inner harbour with quays and warehouses for ordinary mercantile traffic, and another for fishing craft capable of accommodating 300 smacks, are also included in the project, which is stated to have received the sanction of the Government engineers.

THE Committee of the Shipmasters' Society of London are doing their best to enlarge the sphere of the Society's usefulness. We are glad to again remind our readers that this association is now founded on a more secure basis than formerly, and that, if supported by the Mercantile Marine generally, ought to develop into a powerful and useful organisation. The latest departure taken is to have monthly papers read before the Society on matters connected with the profession, and to invite free discussion for the mutual interchange and diffusion of ideas and knowledge. The first paper read was at the Cannon Street Hotel, on 31st January, by Captain Blackmore, "On the Mercantile Marine, its Past, Present, and Probable Future." The subject was ably treated and well received.

MR. R. H. LAURIE, of Fleet Street, calls our attention to the death of Mr. Thomas L. Ainsley, of South Shields, which occurred on the 4th ultimo. Mr. Ainsley was well and widely known amongst captains and officers of the mercantile marine, many of whom all

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over the world passed through his navigation school, or made use of his published works; and now that his career is closed, it is fitting that we should add our testimony to the value of his life's work, and record our sense of the loss sustained by a considerable section of the nautical community.

A CORRESPONDENT at Rangoon writes to us as follows:—The Irrawaddy Flotilla Co., have just had the honour of carrying H.R.H. Prince Albert Victor down the whole navigable length of the Irrawaddy for a distance of nearly 1,000 miles. When it was decided that H.R.H. would visit Burmah and proceed as far as Mandalay, the Flotilla Co. at once placed their finest steamer, the *Beeloo*, at the disposal of His Royal Highness. The *Beeloo* is a paddle-steamer built of steel and almost new, 325 ft. long, 40 ft. beam, engines 500 N.H.P., and one of the finest specimens of an inland steamer afloat in any part of the world. The first-class passenger accommodation is all on the hurricane deck forward, and the whole arrangements for the Prince's reception were under the personal supervision and direction of Mr. Wm. Miller, the sub-manager. The ordinary dining saloon was turned into a delightful drawing-room, adorned with palms and ferns and suitable furniture, the athwart-ship bulkheads of all the starboard sleeping cabins were removed and the whole turned into a charming reading, bed and dressing-rooms with bath-room adjoining. Abaft the saloon on the spacious hurricane deck a large dining-room had been erected with a horse-shoe table to seat 60 persons and lighted throughout with the latest improved incandescent electric lamps. The *Beeloo* was piloted down by another of the Company's steamers in charge of one of the oldest and most experienced commanders, Mr. Fred. Kennedy, C.I.E. The manager of the Company accompanied the Prince in the *Beeloo*, with whom also were Sir C. Crossthwaite, K.C.S.I., Chief Commissioner of Burmah, and several other distinguished guests. The ship made a rapid and safe run down notwithstanding the fact that the bars and shallows at this time of the year render the navigation of the Irrawaddy anything but child's play.

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It is announced that Lloyd's Registry Society is to have a new element in its management. Twelve technical delegates are to be selected from the Institution of Naval Architects, North-East Coast Institution of Shipbuilders, and the Institution of Engineers and Shipbuilders in Scotland, who will be consulted by the present committee in regard to any proposed changes in the rules and practice of the Society.

An interesting statement has recently been made public as to the cost of making a fleet of steamers owned by a North of England firm. The gross earnings of the fleet were £76,000, of which the total expenditure took £55,000. Of the latter £10,000, was paid for port charges; wages and provisions for the crew cost £13,000; insurance £8,000; loading and discharging £6,000; bunker coals and commission to merchants and brokers £3,000. This is in a year of good freights, and there was a substantial profit for division, but when bad times come, as shipowners know to their cost, the latter will disappear while the items of expenditure will remain. In regard to these, the very large item for port charges, nearly one fifth of the total expenditure, is suggestive.

It is often stated that dynamite will not explode when fire is applied to it, but only by the action of a detonator. The crew of the Liverpool barque *British Monarch*, which took fire while on a voyage from Hamburg to Sydney, were wise enough not to trust to what is often said about this explosive. There were ten tons of dynamite on board the vessel, and the crew as soon as they discovered the fire tried to get at the explosive to throw it overboard. They could not do this, and then they wisely took to their boats, remaining by the ship. The boats put off from the ship about 4 p.m., on November 20th, and at 1 a.m., the next day, the fire reached the dynamite, and an explosion of a terrible kind followed. A loud report was heard, and pieces of the burning ship were shot up in the air so high that some of the officers of the whaling barque *Canton*, being 180 miles off, saw pieces of the burning wreck dropping through the air, which they at first thought were falling meteors.

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THE large sums that England is spending upon her Navy are as nothing to the expenditure contemplated by the United States. The new American war fleet will include ten heavily-armed battle-ships of 10,000 tons each; twenty-eight battle-ships of 6,000 to 8,000 tons; ten rams of 8,500 tons and one of 2,000 tons; thirty-five cruisers of 8,000 to 7,500 tons; six cruisers of 1,700 to 8,200 tons; ten gunboats, sixteen torpedo cruisers, and one hundred and one torpedo boats. The vessels already launched or building amount to 68,000,000 dollars; those to be voted during the next few years to 282,000,000 dollars.

INFORMATION has been recently published in British Columbia, which enables one to form an idea of the importance of the seal fishery in Behring Sea, which is the cause of a difficulty between our Government and that of the United States. Twenty-two British schooners were engaged in the fishery last year, employing about 200 white men and 300 Indians. Their total catch was 27,888, but it is claimed that this would have been much larger but for the action of the American cruisers. The average value of a skin is seven dollars.

IT is stated that the trade of Antwerp was 467 tons less in 1889 than in 1888. The tonnage entering Antwerp in 1880 exceeded the combined trade of Rotterdam and Amsterdam, by 400,000 tons, while now it is 150,000 tons less. It appears that excessive dues have driven the trade away from Antwerp harbour. For example, ships of 1,800 tons have to pay in the Scheldt taxes to the amount of 400 francs, which they do not pay either at Rotterdam or Amsterdam.

ON 4th February, a letter appeared in the *Times*, from Lord Brassey, advocating the construction of a dry dock at Gibraltar. This was followed up by letters from Sir John Adye, Mr. G. Baden-Powell, and others, enforcing its extreme importance both to the Royal Navy and the Mercantile Marine, and discussing the best situation for it as regards easy access and also protection in

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the event of war. It is understood that more than one syndicate have been in communication with the Government with a view to constructing the dock, and there is, it would appear, little doubt of the dock being made either under an arrangement between the Admiralty and a private company or directly by the Government itself.

TRITON.

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THE

NAUTICAL MAGAZINE.

FIFTY-NINTH YEAR.

VOLUME LIX.—No. IV.

APRIL, 1890.

In Memoriam.

THOMAS GRAY, C.B.

DIED 15TH MARCH, 1890, AGED 58 YEARS.

IT is our very sad duty to chronicle the death of one who has for many years past rendered great service to us in the conduct of this journal. Our readers must be very familiar with the name and fame of Mr. Thomas Gray, the late Assistant Secretary of the Marine Department of the Board of Trade, and will, we doubt not, share the profound regret to which his comparatively early death gives rise in the hearts of those who knew him and are aware of his untiring and valuable labours in connection with maritime affairs. To us his loss is a real affliction: we shall no longer have the benefit of his willing aid, sound judgment, and extensive knowledge: we realise to the full our loss of a sterling friend and wise counsellor. But we have the satisfaction of knowing and feeling that the spirit which animated his policy is still with us; he has passed away, but the directness of purpose, the hatred of

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shams and superficial sentiment, the desire to improve physically and morally the great industry on which our country depends so largely, are legacies left to us by him, which, as a sacred duty, we shall endeavour to follow and act up to in our future conduct of this journal. Of late years his varied and numerous official duties have prevented his contributing to our pages so freely as formerly, but to the last his interest in the welfare of the *Nautical Magazine* was continued with unabated heartiness. His desire was to see it maintain itself as a sound and useful publication, and continue to deserve the confidence of the maritime community. Our dead friend's wishes are likewise ours, and we shall always endeavour to conduct our journal in the spirit in which he would have advised us to conduct it had he been alive.

But beyond our own immediate concern, Mr. Gray's usefulness in the world at large deserves hearty recognition. His life has been devoted to the interests of the Mercantile Marine and British seamen. His position at the Board of Trade was gained by unremitting attention to the details of his duties. He entered as a junior clerk, and soon got his foot on the lowest rung of the official ladder, of which, when he died, he had for many years been at the top. We may here reproduce the warm eulogy pronounced upon him in a communication to the *Times*, by Sir Thomas Farrer, with whom he served for so many years at the Board of Trade:—"By the death of Mr. Thomas Gray, the public have lost an excellent servant and his colleagues an old and valued friend. The many Presidents whom he has served—the Duke of Richmond, Lord Norton, the Speaker, Mr. Stanhope, Mr. Shaw-Lefevre, Mr. Chamberlain, and Mr. Mundella—would, I am sure, bear willing testimony to his merits. He was one of those men whose energy would have made a mark in any sphere of life, and who, if engaged in business, would probably have amassed a large fortune. He was the son of a poor man who gave his son something better than wealth —a strong character and a sound, practical education. He came

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into the Board of Trade about the year 1851 as a boy clerk at 15s. a week, was attached to the Marine Department, and won his spurs by making himself master of the business of surveying steamships —a branch of work to which he always remained much attached. There was something of genius in his rapid comprehension of mechanical problems, and his knowledge of ships and their machinery was as accurate and extensive as that of a shipbuilder or marine engineer. Few persons have such capacity as he had for making the technicalities of these subjects intelligible. The Duke of Richmond, when he came to the Board of Trade as President, used to say that after an hour with Mr. Gray he felt that he had been all the time in the inside of a ship. But he was not a mere specialist. In all subjects connected with the Mercantile Marine and with the welfare of seamen, in the abolition of crimping, in the improvement of officers, in wreck inquiries, in the commercial code of signals, in all the legislation and administration arising out of Mr. Plimsoll's move, he took a leading, helpful, and useful part. The rules of the road at sea he made almost his own, and his rhymes on that subject are as well known among seafaring men as 'Rule Britannia,' and have been translated into all languages. Like all energetic men, he was fond of power, and sometimes overshot the mark; but he was always public-spirited, loyal, and invaluable to those who trusted him. He was insatiable of work, and drew too largely on his powers. His holidays were work in another form—rough voyages, exposed to hardships in search of practical information to be used in his official duties. His place brought him into inevitable contact—not infrequently collision—with shipowners, sailors, and engineers. But I believe there are few among them who will not now join with me in recognising his devotion to the public service, his energy, and his very peculiar and unusual knowledge of the subjects with which he had to deal."

To this we would add that Mr. Grav's career is a striking

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instance of the triumph of ability and energy over the forces of official inertia and timidity. Having formed his judgment on any matter by a process of logical reasoning, he would boldly proceed to act upon his conclusions, oftentimes to the discomfort of his friends and the unconcealed displeasure of his enemies. He truly had the courage of his opinions, and in making them good against his opponents with force and skill, he frequently gained the respect and admiration even of those against whom he argued or acted.

It is not often that a permanent public official is able to command public recognition of his merits and services. In the vast majority of cases the Government official pursues the even tenor of his way, reaping the comfortable advantages of assured pay, easy work and prospective pension, without attracting public notice. But Mr. Gray's career shows that a clerk may rise to be a power in the State, and may make his life's work of such value that his death is regarded as a loss to the nation.

The tribute of general respect paid to his memory will no doubt be a consoling gratification to his sorrowing family; but a more melancholy satisfaction may perhaps be derived from the consideration that his illness was of such a character that his continued life would have been one of prolonged physical suffering, and that his death released him from much prospective misery and anguish.

The illness which at last proved fatal to him appears to have been brought on by his extraordinary exertions in carrying on his public duties, which ultimately over-taxed his physical powers and brought about his death at the early age of 58 years. It seems to us that the British Merchant Service should take note of this personal devotion and sacrifice to their interests, with a view to raising some memorial of their friend Thomas Gray. And we sincerely trust that the Government, whose faithful servant he was for so many years, may see fit to make to his family some practical recognition of his rare genius, unbounded energy, and unstinted services.

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A DEDUCTION FROM "THE NEW NAVIGATION."

THE following deduction from the New Navigation of the French writers is curious, and may under certain circumstances be useful, as it enables the whole of the work of finding the longitude to be done before the observer goes on deck to take his altitude. It shows also that a heavenly body on the Prime Vertical is practically "on the meridian" *for Longitude*, but that a certain definite altitude has to be observed which is obtained by calculation. It has, so far as I know, hitherto escaped notice, and I append an analytical proof of the fact it depends on.

In a known position on shore, let altitudes of the sun be taken throughout the whole of a day, at intervals not greater than one hour, and the corresponding chronometer times noted. Then assuming any latitude and longitude reasonably near the correct ones, let the altitudes and bearings for these times be calculated. Hence obtain the difference between each observed and the corresponding calculated altitude. Mark this difference + when the observed altitude is greater than the calculated one, and − when the observed altitude is the least. Lay off on a Mercator's chart these differences of altitude from the assumed latitude and longitude. They are to be laid off on their proper bearings if +, on the reverse bearing to that if −. It will be found that all the points thus obtained are on the circle described on the line joining the true and assumed positions. A figure will render this clearer :—

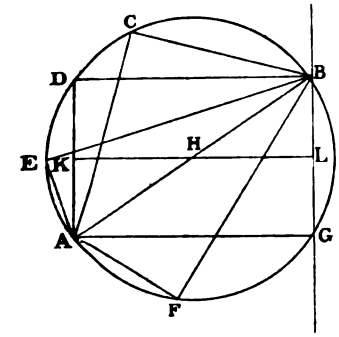

Fig. 1.

Let A be the true position, B the assumed position, and let B C, B D, B E, B F, and B G, be differences of altitude laid off in accordance with the rule given above. It will be found that

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they all lie on the circle described on A B as diameter. This is a fact which I have verified by experiment, but it is a long process, so I append the following considerations from accepted problems in navigation which tend to confirm it. One method of laying down a "Sumner" line, is to work the bearing of the sun at the time of observation and to lay down the line at right angles to the bearing as a "Sumner" line. This is equivalent to the process given above, except that the longitude given by the observed altitude is used instead of its difference from the calculated altitude. Again in the New Navigation, as it is called, of certain French authors, the position of a ship is found by laying off as above the difference between the observed and calculated altitudes, and drawing lines at right angles to these bearings through the points so formed. The intersection of two such lines is the true position of the ship. This is our process precisely, and it is well known that the locus of the vertices of a series of right angled triangles described on the same hypotenuse is a semicircle. It will be seen as in the figure that the lines A F, E A at right angles to B F and B E, intersect at A, as do also D A and C A.

Two consequences of this fact seem to have escaped due notice.

Take first B G. When the body is on the meridian, B G the difference between the observed and calculated altitudes is also the difference of latitude between the true and the assumed positions of the ship. We know this is true, but practically it is not of much utility.

But when the body is on the prime vertical, B D the difference between the true and calculated altitudes is equal to the departure between the true and assumed positions. This is also seen from other considerations, for let P be the pole, Z the true zenith, Z X the true zenith distance, Z_1 the supposed zenith, Z_1 X the supposed zenith distance, then when the body bears either East or West P Z X = P Z_1 X = 90°, and Z Z_1 = difference of zenith distances, *i.e.*, the difference between the observed and calculated altitudes. But if Z and Z_1 are in the same latitude, Z Z_1 also measures the

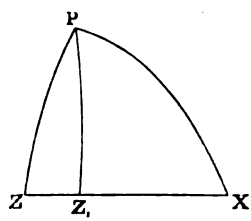

Fig. 2.

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departure between them. Now it follows that if Z Z_1 = departure, the angle Z P Z_1 is equal to the difference of longitude. This angle is easily measured in time, for it is the difference between the observed and the calculated time of the sun's attaining a certain altitude, which is the altitude it should have on the prime vertical in the latitude in which the ship is supposed to be.

There are two theoretical objections to the accuracy of the above statements which must be noted.

The first is that D B (fig. 1), is not the departure between A and B, that being more nearly measured by a line in the position K L than by D B.

The second is that unless the latitude is accurately known (which by hypothesis is never the case), D B or Z Z_1 is never accurately measured, that Z Z_1 or Z Z_2 is what is measured (according as the true position is to the Northward or Southward) not Z O.

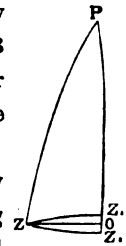

Fig. 3.

Theoretically both objections are valid, but practically they do not affect the result. The error due to taking D B as the departure will never be of any practical moment.

The error due to the latitude not being accurately known might conceivably be of moment in low latitudes where the sun (when on the prime vertical), is vertical or nearly so, and where consequently the curve of equal altitude is a true circle. On that point I should be glad to get practical information, but in our own latitude where the zenith distance, when on the prime vertical, is never less than 60°, it does not appear to make any difference. And in any case we know that when the sun is on the prime vertical, a given error in latitude will have the least effect on the altitude, and hence on the difference of altitudes, which, in our view, is then the departure.

The method of working the problem is simple.

In the right-angled triangled P Z X we have given

P Z = Colatitude,

P X = Polar Distance,

to find Z P X the Hour Angle, and Z X the Zenith distance.

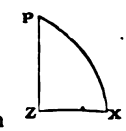

Fig. 4.

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By the usual processes we get the equations.

Cos Hour Angle = Cot Lat. Tan Dec (1).

Cos Altitude = Sin Hour Angle, Cos Dec. (2).

From these (beforehand) we get the Hour Angle (which is to be turned into Apparent Time at place); and the altitude, which is to be corrected the reverse way, and the corresponding observed altitude of the sun's lower limb obtained. Placing this angle on the sextant, and allowing a reasonable time before the sun comes on the prime vertical, the observer goes on deck, and notes by watch the time at which the sun has the altitude placed on his sextant. The difference between this time and the apparent time at place obtained from equation (1) is the difference of longitude in time between the assumed and the true longitudes of the ship.

To apply it, the following rule of thumb may be useful.

Make a rough compass on the work-book. Call the time at which the sun actually has the computed altitude, T = True position. Call the calculated time obtained from Equation (1), S = Supposed position.

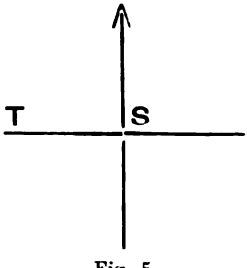

Fig. 5.

Whichever arrives first mark the corresponding letter in the *centre* of the compass, and place the other one at the *West* point. The letters will indicate the bearing of the true and supposed positions, and show how the difference of longitude must be applied. In the figure given above, the calculated time from equation (1) arrived before the sun had attained the altitude on the observer's sextant, and S was accordingly marked in the centre. Hence the true position of the ship is to the westward of the supposed position, and the navigator will apply the difference of longitude according to which longitude (E. or W.) he happens to be in.

Or, the observer may take the usual set of three or five observations about the time the sun is on the prime vertical, and find the actual time it had the required altitude by interpolation. This is a little longer, but in some ways it is, perhaps, a more satisfactory process. It does not much matter which process is used, so long

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as the time of the particular altitude is noted. In fact, when on the prime vertical the sun is "on the meridian" for longitude in the same way as at noon it is on the meridian for latitude, only that we have to take a particular altitude instead of waiting for the sun to cease to rise.

A word as to limits of error, accuracy, etc. I have not yet tried it beyond 20 minutes error in latitude N. or S., and 40 minutes error in longitude E. or W.; but I am sure those limits might be doubled without affecting its accuracy. I have chosen them because in Captain Martin's recently published work on Navigation these are the greatest errors assumed in any of his Double Chronometer or Sumner problems.

The accuracy of the whole thing depends on the accuracy of the chronometers. The problem is not workable unless you have accurate Greenwich time on board, hence any error in Greenwich time will produce a similar error in the longitude at the known rate of one mile in longitude to 4″ of time. This defect is, however, common to all longitude problems except the lunar.

Bad horizon and personal equation affect it in precisely the same manner as they affect the working of the usual chronometer problem. In fact, as a rule it will give the same result, good or bad, as the chronometer, the advantages I claim for it being that it is simpler and easier to work, and that a set of sights being taken will give the same result, however the latitude and longitude worked with may be varied. This I shall show in the examples.

Its peculiar defect is that it is only possible when the body is on the prime vertical, which, in any given latitude, limits its use (with the sun) to somewhat less than half the year.

On 18th June, 1888, in lat. 52° 14′ 30″ N., long. 2° 3′ 30″ W. (D.R.) the following sights were taken about 7^h 30′ a.m. :—

{True Lat. 51° 54′ 30″ N. True Long. 2° 3′ 30″ W.}

(1.)	7°	21′	1″	⊙_	59°	32′	10″
(2.)	7	23	0	—	60	9	10
(3.)	7	25	4	—	60	47	30

The index error was − 55″ for sextant. The error of artificial

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horizon balances the refraction. The error of watch on G. M. T. was 5′ 28″ +. Required the longitude.

From *Nautical Almanac:*

Dec = 23° 25′ 38″

Eq. T. = 54″ — from Mean Time.

Eqⁿ (1). Cos H A = Cot Lat. Tan Dec.

9,636788

9,889030

9,525818 = 4ʰ 41′ 34″ H A.

19	18	26	A T.
	8	14	Long. in Time.
19	26	40	
		54	Eqⁿ T.
19	27	34	
	5	28	Er. of W.
19	22	6	Time sun is on P V.

Cos Alt. = Sin H A, Cos Dec.

9,962638

9,974054

9,936692 = 30° 11′ 27″

	15	46	
29	55	41	
		2	
59	51	22	
		55	
59	52	17	Observed Alt.

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From sights (1) and (2) we find the variation in altitude for each second of time is 18″·65, and from sights (2) and (3) that it is 18″·55. Hence we use 18″·60.

59° 52′ 17″ Req^{d} Alt.
59 32 10 Sight (1)

20 7
60

18·6) 1207 (65″
1116

910
930

Time of Sight (1) 7^{h} 21′ 1″
1 5

Time of Req^{d} Alt. 19 22 6

Time of Req^{d} Alt. = 19^{h} 22′ 6″ = T.
Calculated Time = 19 22 6 = S. ∵ T = S.

Hence the supposed longitude is correct, which is really the case.

If we assume 2° 20′ 00″ W. for the longitude, we get as before;

H A = 4^{h} 41′ 34″

19 18 26 A T.
9 20 Long. in T.

19 27 46
54 Eq. T.

19 28 40
5 28 Er. of W.

19 23 12 = Time sun is on P V.

The altitude and its time will be as before.

Hence:

Time of Req^{d} Alt. 19^{h} 22′ 6″ = T.
Calculated Time 19 23 12 = S.

Diff. Long. = 1 6 = 16′ 30″ Arc.

∴ 2° 20′ 0″ W. Supposed Long.
16 30 Diff. Long.

W. 2 3 30 Long. in (as before).

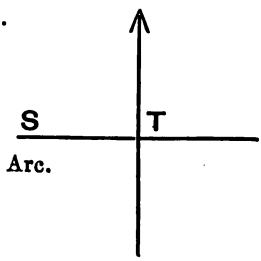

Fig. 6.

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Now alter the latitude. Suppose latitude to be 51° 34′ 30″ N., and longitude 1° 23′ 30″ W.

Cos H A = Cot Lat. Tan Dec.

9,636788
9,899438
9,536226 = 4ʰ 39′ 35″ H A.

19	20	25	A T.
	5	34	Long. in Time.
19	25	59	
		54	Eq. T.
19	26	53	
	5	28	Er. of Watch.
19	21	25	Sun on P V = S.

Cos Alt = Sin H A, Cos Dec.

9,962638
9,972699
9,935337 = 30° 29′ 47″ Alt.

	15	46
30	14	1
		2
60	28	2
		55
60	28	57 Alt. to be obsᵈ.

60° 28′ 57″ Reqᵈ Alt.
60 9 10 Sight (2)

19 47
60

18·6) 1187 (64″
1116
710
744

Time of Sight (2) 7ʰ 23′ 00″
1 4
Time of Reqᵈ Alt. = 19 24 4

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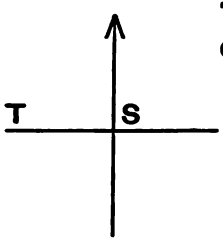

Time of Req^{d} Alt. 19^{h} 24′ 4″ = T.
Calculated Time 19 21 25 = S.

Diff. Long. = 2 39 = 39′ 45″ Arc.

Supposed Long. 1^{h} 23′ 30″
Diff. Long. 39 45

Long. in 2 3 15 W.

Fig. 7.

On 27th June, 1888, about 7.30 a.m., in Latitude (supposed) 51° 34′ 30″ N., Longitude (supposed) 1° 23′ 30″ W., the following sights were taken. Required the longitude. The index error of the sextant is − 1′ 40″. The error of the artificial horizon is the same as the refraction and balances it. The error of the Watch on G. M. T. is 12″ +.

	Watch.		
(1.)	7^{h} 24′ 00″	⊙	58° 6′ 10″
(2.)	7 26 16	−	58 47 40
(3.)	7 29 19	−	59 44 20

From the *Nautical Almanac* we obtain :

Dec = 23° 18′ 57″ N.
Eq. T. = 2 49 − from Mean Time.

Eq^{n} (1). Cos H A = Cot Lat. Tan Dec.

9,899488
9,634472
9,533910 = 4^{h} 40′ 2″

4^{h} 40′ 2″	H A.
19 19 58	Appr. Time.
5 34	Long. in T.
19 25 32	
2 49	Eq. T.
19 28 21	
12	Er. of W.

Hence Sun is on Prime Vertical at 19 28 9

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Eq^{n} (2). Cos Alt. = Sin H A, Cos Dec.

9,963001
9,973003

9,936004 = 30° 20′ 48″.

30°	20′	48″	
	15	46	
30	5	2	
		2	
60	10	4	
	1	40	
60	11	44	= Observed Alt. on Prime Vertical.

Now from sights (1) and (2) we find that the change of altitude per 1″ of time is 18″·30; and from sights (2) and (3) that the change is 18″·58. We will therefore use 18″·45. It appears also that we have not taken a sight to include the required altitude, so we must calculate forward from the last.

60°	11′	44″	Req^{d} Alt.
59	44	20	Sight (3).
	27	24	
		60	

18·45) 16440 (89″·1
14760
16800
16605
1950

Hence at 89″ after the last altitude the sun was at an altitude observed of 60° 11′ 44″.

7^{h}	29′	19″	Time of Sight (3).
	1	29	
19	30	48	Time of sun's attaining required Alt. = T.
19	28	9	Calculated time of sun's having that altitude = S.
	2	39	= Diff. Long. = 39′ 45″ Arc.

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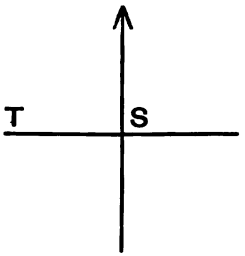

Fig. 8.

∴ The true position is West of the supposed.

1°	23′	30″	W. Supposed Long.
	39	45	Diff. Long.
2	3	15	W. Long in.

The actual Lat. and Long. are:

51° 54′ 30″ N.
2 3 30 W.

Take the same sights, suppose the latitude the same, but the longitude to be 2° 43′ 30″ W., *i.e.*, 40 miles the other side of the true position.

Then we find as before:—

H A = 4^h 40′ 2″

4^h	40′	2″	
19	19	58	
	10	54	Long. in Time.
19	30	52	
	2	49	Eq. T.
19	33	41	
		12	Er. of W.
19	33	29	Time Sun in on Prime Vertical

The altitude will be 30° 20′ 48″ as before equal to 60° 11′ 44″ observed altitude.

This as before will be found to come on at 19^h 30′ 48″.

Hence 19^h 30′ 48″ = T
19 33 29 = S

Diff Long. = 2 41 = 40′ 15″ Arc.
∴ 2° 43′ 30″ W. supposed Long.
40 15 Diff. Long.

2 3 15 Long. in (as before).

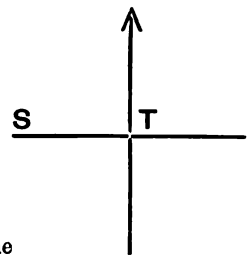

Fig 9.

Hence, with a latitude 20′ in error to the southward, it apparently does not matter where the longitude is assumed within a limit of 40′ either way.

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I think it will be seen from the foregoing that no error (within reasonable limits) in the dead reckoning position has any effect on the longitude when found by this method.

Analytical proof that the curve traced out by laying off the differences between the observed and calculated altitudes of a heavenly body (under the circumstances given at the beginning of this paper) is a circle.

I commence by establishing two preliminary propositions:

1. In any spherical triangle A B C,

$$\text{Cos B Sin } c = \text{Sin } a \text{ Cos } b - \text{Cos } a \text{ Sin } b \text{ Cos C} \quad (1) -.$$

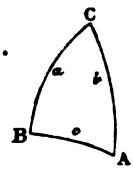

Fig 10.

From the fundamental formulæ for spherical triangles (Jean's Trig., Pt. II., p. 62, S, or any similar treatise), we have

$$\text{Cot B Sin C} = \text{Cot } b \text{ Sin } a - \text{Cos } a \text{ Cos C}.$$

$$\therefore \frac{\text{Cos B}}{\text{Sin B}} \text{ Sin C} = \frac{\text{Cos } b}{\text{Sin } b} \text{ Sin } a - \text{Cos } a \text{ Cos C}.$$

$$\therefore \text{Cos B Sin } b \frac{\text{Sin C}}{\text{Sin B}} = \text{Cos } b \text{ Sin } a - \text{Cos } a \text{ Sin } b \text{ Cos C}.$$

$$\therefore \text{Cos B Sin } b \frac{\text{Sin } c}{\text{Sin } b} = \text{Cos } b \text{ Sin } a - \text{Cos } a \text{ Sin } b \text{ Cos C}.$$

$$\therefore \text{Cos B Sin } c = \text{Sin } a \text{ Cos } b - \text{Cos } a \text{ Sin } b \text{ Cos C (Q.E.D.) (1).}$$

2. In any calculation in navigation, a small change in the Hour Angle (from the meridian of the place,) of the heavenly body which is the subject of calculation, causes a corresponding small change in the Longitude, *i.e.*,

$$d \text{ Hour Angle} = d \text{ Long.}$$

This is nearly self-evident, but in the following figure,

Let

P O and P O_1 be the observer's meridian;

P S and P S_1 be the meridian of the bodies observed;

P F be the meridian of Greenwich;

P be the Pole.

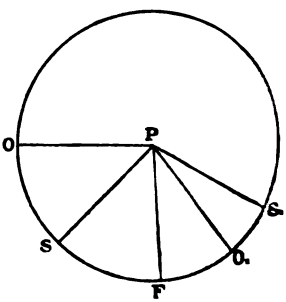

Fig 11.

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We have

O P F or O_1 P F = Observer's Longitude.

S P F or S_1 P F = *Hour Angle from Greenwich of the body.*

O P S or O_1 P S_1 = Hour Angle of body from observer's meridian, *i.e.*, meridian distance.

Now in the one case

$$O P S = O P F - S P F,$$

i.e., Hour Angle = Longitude − Hour Angle from Greenwich, and in the other

$$O_1 P S_1 = S_1 P F - O_1 P F,$$

i.e., Hour Angle = Hour Angle from Greenwich − Longitude. Therefore always

$\therefore$ Hour Angle = Hour Angle from Greenwich $\sim$ Longitude (ϕ).

But in any calculation the Hour Angle from Greenwich of any body is a *constant* quantity; for it is obtained from the Greenwich mean time (known accurately by chronometer), and the Sidereal time with its acceleration together with the right ascension of the body, all these last being elements from the *Nautical Almanac*.

Hence if we differentiate (ϕ)

$$d. \text{ Hour Angle} = \pm d. \text{ Long. (Q E D).}$$

In the spherical triangle P Z X,

Let

P be the Pole,

Z be the Zenith,

X be the observed body.

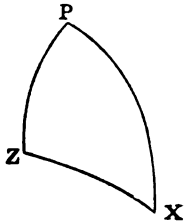

Fig. 12.

Then we have

P Z = Colat.

P X = Polar Distance.

Z X = Zenith Distance.

Z P X = Hour Angle.

P Z X = Azimuth.

From fundamental formulæ

Cos Z X = Cos P Z Cos P X + Sin P Z Sin P X Cos Z P X

Sin P Z X Sin Z X = Sin P X Sin Z P X,

and from (1) ante

Cos P Z X Sin Z X = Sin P Z Cos P X − Cos P Z Sin P X Cos Z P X.

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Now

$(90 - P Z) =$ Latitude $= L$

$(90 - P X) =$ Declination $= D$ and $(90 - Z X) =$ Altitude $= p$

Let $P Z X = Z$ and $Z P X = P$.

$\therefore \text{Sin } p = \text{Sin L Sin D} + \text{Cos L Cos D Cos P } (\alpha).$

$\text{Sin Z Cos } p = \text{Cos D Sin P } (\beta).$

$\text{Cos Z Cos } p = \text{Cos L Sin D} - \text{Sin L Cos D Cos P. } (\gamma)$

Differentiate α taking D constant.

$$\therefore \text{Cos } p, dp = \text{Cos L Sin D } d\,\text{L} - \text{Sin L Cos D Cos P } d\,\text{L} - \text{Cos L Cos D Sin P } d\,\text{P}.$$

$$= (\text{Cos L Sin D} - \text{Sin L Cos D Cos P})\, d\,\text{L} - \text{Cos L Cos D Sin P } d\,\text{P}.$$

$$= \text{Cos Z Cos } p\, d\,\text{L} - \text{Cos L Cos D Sin P } d\,\text{P} \quad \text{by } \gamma.$$

$$= \text{Cos Z Cos } p\, d\,\text{L} - \text{Cos L Sin Z Cos } p\, d\,\text{P} \quad \text{by } \beta.$$

$$= \text{Cos Z Cos } p\, d\,\text{L} \pm \text{Cos L Sin Z Cos } p.\, d\,\text{Long.} \quad \text{by (2).}$$

$$\therefore dp = \text{Cos Z } d\,\text{L} \pm \text{Cos L Sin Z } d\,\text{Long } (\theta).$$

Now in the figure opposite.

Let P and X be as before.

Let Z_1 be the supposed zenith.

Let Z be the true zenith.

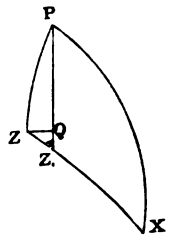

Fig 13.

Then

$Z Z_1 Q = V$ is the course from the assumed to the true position of the ship.

$Z Z_1$ is the distance $= S$.

$Z Q$ is the departure.

$Q Z_1$ is the difference of latitude.

Now since $Z Q Z_1$ is a small triangle, we may without material error consider it as a plane triangle.

$\therefore Q Z_1 = Z Z_1 \text{ Cos V},$

i.e., d Lat. $= \text{S. Cos. V.}$

And $Z Q = Z Z_1 \text{ Sin V.}$

i.e., Dep. $= \text{S. Sin V.}$

$$\therefore d\,\text{Long} = \frac{\text{S. Sin V.}}{\text{Cos. Lat.}}$$

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Substituting in θ we have

$$d\,p = \text{Cos. Z, Cos. V, S} \pm \text{, Cos. L, Sin Z, } \frac{\text{Sin V. S,}}{\text{Cos. L.}}$$
$$= \text{S (Cos. Z, Cos. V,} \pm \text{Sin Z, Sin V.)}$$
$$= \text{S Cos. (Z} \pm \text{V.)}$$

or, since $d\,p$ is really the difference of altitude we get if we pursue the course of observations detailed at the beginning of this paper

$$p = \text{S. Cos } \theta.$$

And this is the polar equation to the circle, where the initial line is a diameter and the origin is at one end of it. Hence the *locus* of p is a circle.

The foregoing proof is strictly rigid (the error made by taking the triangle Z Q Z_1 as plane, excepted) in the case of the fixed stars only. We have assumed that the declination does not change. This will not be true with the sun, but as the interval between sights will rarely be more than five hours, this will only give a change of declination of 5′ when the sun is moving fastest, in March and September. Now the circular measure of an angle of 5′ is ·00175 about. It will be found if we get an expression for the true value of $d\,p$ from Eq^{n} a that d Dec enters *by itself* into one term only, viz., Cos P X Z. d Dec, and under these circumstances (especially if the body is observed when the angle P X Z is large) no material error is introduced.

PHILIP R. H. PARKER,
CAPTAIN R.N. (RET^{D})

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THE ICY ATLANTIC.

EXTENSIVE fields of ice and scores of lofty icebergs have made their way to the southward exceptionally early this year. The valuable North Atlantic Pilot Chart for February, issued by the United States Hydrographer, draws the special attention of shipmasters navigating the troubled expanse of waters between Europe and North America to the important fact that no fewer than 43 reports of such drifting dangers, appropriately termed "floating rocks" by that great circumnavigator, Captain Cook, had been received at Washington during January, from ships which had passed them on the trans-atlantic route. The exact geographical position in which each iceberg was observed is clearly indicated on these truly practical guides for seamen which are scattered broadcast at the expense of the United States for the benefit of seafarers sailing under any flag whatsoever. Several serious collisions have occurred between steamships and icebergs driving silently athwart this most frequented of all the oceanic highways. The *Dania* passed fifty bergs, great and small, and steamed through much field-ice. *La Bretagne* passed a large berg, and had to cleave her way through several ice fields. The *Umbria* had to run 20 miles to the southward of her track in order to avoid the low drifting ice that impeded her advance for more than an hour. The *Tower Hill* was detained 12 hours by ice on 4th February, and on the same day the *Pennsylvania*, in 48° N., had to seek open water along a more southerly parallel. The *Mareca* was imprisoned by the ice for four days and nights. The crew suffered some of the rigours of an Arctic voyage, for the temperature was so far below zero that spirits were frozen. She sighted a small fishing schooner firmly fixed in the ice in an inaccessible position. Not a man could be seen on the fisherman's deck, but smoke was observed, showing that a fire was burning in the cabin. Twenty large bergs were in sight at that instant. The *Yorkshire* sighted much ice on 8th February: in 44° N., 48° W., she came up with the brigantine *Silvia*, showing distress signals. A boat proceeded from the

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steamship to the brigantine, which was 67 days out, bound from Figueira to St. John, had been six days in the ice, and was much chafed. Her crew had been on short allowance for some days, had suffered severely from the intense cold, and were overjoyed at the unexpected additions to their scanty stock of provisions, which were at once supplied by the captain of the *Yorkshire*. The barque *Oliver Emery* was sighted by the *Amsterdam*, on 6th February, near the Banks. She had collided with an iceberg, was leaky, had lost part of her stem, and was short of provisions, for she was then 75 days out, bound from Dublin to St. John. Her wants were made good by the steamship which passed close to a berg that was 200 feet high, and over 500 feet long. Nine other bergs had been counted in close proximity, when a thick fog supervened and shut them out from view.

Icebergs are a fertile source of danger to shipping in the North Atlantic from March to August, but as early as 5th January icebergs were seen this year in 47° N., 45° W., and 16 days later some were passed in 44° N., 41° W. Such undesirable harbingers of spring are not altogether unknown so early in the season. A ship, the *Wabens*, collided with a berg in mid-Atlantic, on 5th December, 1868, and was abandoned by her crew, who were rescued from their perilous position by the Inman liner, *City of Boston*. On New Year's Day, 1844, the ship *Sully* passed an iceberg in 45° N., 48° W., and two years ago, on 3rd January, a berg was sighted not far from the Banks. In the spring of 1874, ships with their sails furled and frozen in were passed 27 miles south of the average southern ice limit laid down on the Admiralty Chart. In January of that year, the usual track by the *Flemish Cap* was closed by an ice-field, stretching south, north, and east, as far as could be seen from the masthead on a clear day. A publication of the Netherlands Meteorological Office sets forth that a large iceberg was seen one year on 28th December in 46° N., 48° W. We are not able, however, to discover any record of ice of any kind having been seen in the North Atlantic during the months of October and November, so that we may fairly assume that this period is the closed time for icebergs in that ocean. A berg, however, was once seen on 27th September in 47° N., 47° W.

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Icebergs of the North Atlantic have their origin in the sterile regions circumjacent to the North Pole. Greenland glaciers march majestically over gentle declivities towards the sea. The ponderous snouts of these rivers of ice, which Coleridge speaks of as "Motionless torrents! Silent cataracts!" invade the waters which wash those inhospitable shores; are wrenched away by the upward bearing pressure; and the resulting icebergs, after a few somersaults, are free to be acted upon by current, wind, and temperature. Pre-historic glaciers have scratched their old-time story upon some of our loftiest hills, and it is probable that during the glacial epoch icebergs were formed not far to seaward of the west coast of Ireland in much the same way as they are "calved" to-day in the far North. Scoresby counted 500 bergs at one time, all proceeding to the southward; and Markham, when on his amateur whaling cruise to Baffin's Bay, saw fully 700 or 800 icebergs under similar conditions.

Ross observed several bergs in Baffin's Bay not far removed from each other, which were aground where the arming of the deep-sea lead showed that the depth of water was 1,500 feet. Bergs have often been passed on the Banks of Newfoundland in 650 feet of water, which drew more than that, and were consequently detained by the bank. The *Mineola* passed a berg in 45° N. 49° W. on 29th January, which is said to have been about one mile long and 700 feet in height. Water expands in the act of congelation, so that a given volume of ice will weigh less than a similar volume of water, and will float upon it with about one-ninth of the icy mass exposed to view. Hence, a berg having an altitude of 700 feet above the sea surface might have a total altitude of more than 6,000 feet, measured from its base to its summit; but it must be borne in mind that icebergs are not regular geometrical solids, so that there cannot be an invariable relation between the height above and the depth below the water-line of a berg. A respectable distance must be kept from an iceberg; for a ship has approached one too closely and received damage by striking on parts of the berg concealed under water like a fringing reef; or has had a berg topple over upon her owing to the displacement of its centre of gravity, consequent upon unequal melting of the several parts of

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the icy mass. North Atlantic icebergs, however, are not such stupendous specimens of Nature's handiwork as those of the Southern Hemisphere, which may be met with to the southward of a line drawn on a chart of Mercator's Projection from the Cape of Good Hope to the Falkland Islands. In May, 1887, the iron barque *Inchgreen* passed an iceberg in the Southern Ocean, which was seven miles long, and showed a side of 700 feet above its water-line! A huge ice island was seen by many ships for several consecutive months in about 42° S. 24° W., which was supposed to have been formed by the cohesion of several small ice islands. This immense ice island was 300 feet high, 40 miles wide, 60 miles long, and shaped like a horse-shoe. A large emigrant ship, the *Guiding Star*, stood unsuspectingly into this icy bay, and was lost with all hands. Other ships were similarly entrapped, and experienced great difficulty in beating back again to open water and safety. North Atlantic icebergs are irregular in outline, with pinnacles glistening under the softening influence of a vernal sun; or, with cascades of fresh water leaping down their rugged sides when the sun is nearer to the summer solstice. Southern Ocean icebergs are of tabular shapes, and much more solid-looking than those of the North Atlantic, inasmuch as their formation is more regular. They are gently severed from the southern ice cap without having to wend their ways through tortuous fiords. Mr. Noble, in his work entitled *After Icebergs with a Painter*, has said that one berg seen near the Straits of Belle Isle was so large that an entire block of Broadway buildings could easily have been cut out of it. Those who are familiar with this part of New York will be able to estimate the size of this terrible mass of ice and agree that northern bergs may occasionally compare favourably with those of southern regions.

Bergs laden with earthy matter brought from the Arctic regions, together with seals and polar bears, have often been observed both in mid-Atlantic and near their birthplace. Ross saw a berg in the Great Southern Ocean in which were embedded large lumps of rock. Its surface was also strewn with mud and small stones. The portions of rock must have weighed many tons, and specimens showed that they were of volcanic origin. Another

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berg seemed so much like an island of earth that the illusion was only dispelled by landing upon it. In 1794, and again in 1845, ships were seen high and dry on immense ice islands, drifting hither and thither in mid-Atlantic. The brig *Renovation* passed a huge berg about 90 miles east of Newfoundland, on which, according to the unshaken testimony of her officers, two dismantled vessels were snugly stationed. This was in April, 1851; and many inferred that these ships were the ill-fated *Erebus* and *Terror* of Sir John Franklin's long-lost expedition. Subsequent discoveries, however, tend to disprove this theory; but it still has supporters, and receives some tinge of truth from the known tendency of the surface-water to flow southward out of Baffin's Bay, as evinced by the drift of the *Resolute*, of the *Fox*, and of the *Advance*. It is this southern-seeking cold current of water which brings down field-ice and icebergs on its broad bosom, and renders the northern ports of the United States so difficult of access to sailing-ships in winter time. Blinding snowstorms and whirling cyclones frequently ice up a vessel to such an extent that she has to be run back into the warmer waters of the Gulf Stream, in order to infuse fresh vigour into her frost-bitten crew. We have known an instance of a schooner, bound from New York to Nova Scotia, having almost reached her port and been driven back to Bermuda after many days. In Mr. Hayden's paper on the awful blizzard of March, 1888, we are afforded a thrilling word-picture of the experience of the American ship *Annie M. Smull* in that savage storm. She lay in a frightful sea, her lee yard-arms in the water, her decks swept, sails blown away, yards sprung, 4 ft. of water in her hold, steering by tackles, and covered with snow and ice. Immediately the hurricane moderated a little she was got before the wind, and her captain noted in her log-book, "Intend to run for warm water, and thaw out." She eventually dropped anchor at Bermuda. Prior to Dr. Franklin's discovery of this remarkable river in the ocean, it was not an unusual occurrence for vessels bound to New York in the depth of winter to be beaten back again and again by adverse winds for 40 or 50 days, and finally keep away for one of the West India Islands, there to remain until spring before making another attempt to reach their

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destined haven. The cold ice-bearing Labrador current which washes the American coast, and the warmer waters of the Gulf Stream on this side of the North Atlantic, conspire to make our climate more temperate than that of American ports situated within the same parallels of latitude. The mean temperature of Ireland in 52° N. is as high as places on the American coast, which are 15° nearer to the equator.

Suffering resulting from collision with ice was not infrequent in the "good old days," when emigrants were huddled together, with little regard to decency or comfort, in small sailing brigs which will not bear mention in comparison with the palatial steam liners of to-day. The *Hannah*, a brig of 150 tons, bound from Newry to Quebec with 200 emigrants, struck an iceberg in April, 1849, and went down head foremost. Her crew and passengers had barely time to scramble on to the ice whence the survivors were rescued after a day's exposure to a pitiless storm with the temperature below the freezing point. Nearly half the number perished. The *Lady of the Lake*, bound from Belfast to Quebec, also with 200 emigrants, collided with a berg and was abandoned ere she sank. Her boats were neither provisioned nor provided with oars, so that only one man was saved, and he by a boat from the *Harvest Home*, which vessel had also been abandoned under similar circumstances. An American packet-ship, the *John Rutledge*, met a like fate one February, and but one man escaped delirium and death in the unprovided open boats.

It is a vexed question whether there is a possibility of obtaining timely indications of the presence of icebergs from a fall in the temperature of the water surrounding a ship. Professor Tomlinson, F.R.S., says in one of his works that icebergs "cool the water sensibly to the distance of 40 or 50 miles around, the thermometer sinking 17 or 18 degrees in their neighbourhood." The same author in another work tells us that icebergs "cool the water to the distance of 30 or 40 miles, and the air to a much greater distance." Nothing can be more explicit; but, unfortunately, the nautical experience of practical shipmasters is diametrically opposed to the theory of the learned landsman. Captain Lecky, in his *Wrinkles in Practical Navigation*, has overwhelmingly demon-

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strated that changes in the sea surface temperature are of little avail to the navigator in connection with icebergs. He obtained opinions from Captains Ballantine, Dutton, and Smith, three well-known and most experienced commanders of the Allan Line, which were unamimous to the effect that "no appreciable difference in the temperature of the water is caused by the proximity of even the largest icebergs." An ounce of practice is worth a ton of theory, and this decided expression of opinion based upon much navigation among ice is entitled to precedence. Sir William Thomson, however, whose name is familiar to seamen of the sister services, wrote that there would be absolutely no cooling effect by conduction to a distance from an iceberg, but that light fresh water running off a berg might cool the sea surface and have a considerable effect. Captain H. Toynbee, the then Marine Superintendent of the Meteorological Office, did not believe that an iceberg would have much effect on the sea temperature, but it might affect the temperature of the *air* to leeward of the icy mass. We are left in doubt as to whether this opinion was founded upon a comparison of observations of sea temperatures and icebergs recorded in meteorological log-books; or upon his own experience, or was merely conjectural. The Admiralty *Wind and Current Charts* recommend that the indications of the thermometer should not be neglected when in the neighbourhood of ice, as there is generally a diminution in the temperature of air and sea when approaching a berg, but this must not be assumed as an infallible guide. Failing the sea temperature as a guide, it has been proposed to sound the steam-whistle occasionally in those latitudes where ice is expected and await the echo afforded by an iceberg. Fog, however, is known to give an echo at times which might mislead. An instrument has been devised for picking up echoes from icebergs which, by suitable electric appliances, can be used in the chart-room or even in the captain's berth. The late astronomer, R. A. Proctor, thought that the thermal radiation method might be utilised to give warning of the proximity of an iceberg, and drew out the rough plan of an apparatus for this purpose. Neither the reflection of sound, nor the radiation of heat, has yet been advanced beyond the strictly theoretical stage

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for this purpose, and when we remember the various noises and the difference in local temperatures on board a steamship, these methods seem impracticable. Nothing as yet will supersede a diligent look-out by men blessed with good eyesight. The Mississippi and Dominion Steamship Company in 1874, issued a specially prepared chart and code of ice signals to their commanders, by means of which they were enabled to give handy information to an approaching steamer of the state of the track with respect to ice. Flags were used by day, Colomb's flashes by night, and simplicity was the distinguishing feature of chart and code.

It has been urged that the prevalence of icebergs in the North Atlantic, greater in some seasons than in others, may have some effect upon the climate of Western Europe. Professor Archibald recently recommended that a searching enquiry should be instituted into the condition of the ice every year near Iceland, in the hope that some light might be thrown upon the suppositious connection between a great abundance of icebergs in the North Atlantic and abnormally cold summers. There is nothing new in this theory, for Mr. Fairbairn, at the British Association meeting of 1842, affirmed that the unusually large quantity of ice in the North Atlantic was probably the cause of the cool weather during the summers of 1838-40. He asserted that at the beginning of the present century icebergs did not make their appearance in the North Atlantic until the autumn, whereas they were well to the southward in March of that year. M. Renore, in 1826, attributed the cold of that summer to the many icebergs in mid-Atlantic. Going to more remote times we read, in the Memoirs of the French Academy of Science, that icebergs were seldom met in the North Atlantic lower than the 67th parallel of latitude; but, in that year, 1725, ice was as far south as the 41st parallel, and the cool summer experienced in Europe was due to this cause.

The North Pacific is singularly free from icebergs, and Maury pointed out that this is due to the fact that the water of Behring's Strait is too shallow to let them pass out into the open ocean. Seafarers and others interested in the ice and ice movements in Behring's Sea and the Arctic Basin will obtain every information from the clearly written pamphlet of Ensign

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E. Simpson, U.S.N., issued a few days since by the United States Hydrographer.

In conclusion we would add that shipmasters will confer a lasting benefit on their fellow creatures by carefully noting the readings of a sea surface when in the vicinity of ice, and making their results public, together with any other hints for the avoidance of an iceberg, especially in foggy weather.

THE JANUARY GALES AND THE BAROMETER.

DURING the latter part of the month of January, from the 18th to the 28th, severe storms swept across the Atlantic and burst upon these islands with a fury and violence described in the Meteorological Notices of the daily papers as "unprecedented" and "terrific." In some of them the gales are mentioned as being the heaviest that living seamen could remember in the whole of their experience, and generally the opinion seems to prevail that the weather during the period I have named above was as bad as it well could be.

The direction of the winds were from W.S.W. and S.W., flying round to N.W., as is usually the case in these parts, and bringing with the change hail and snow instead of rain. The storms were generally attended by thunder and lightning, a circumstance worthy of note.

Under such conditions as these, which prevailed almost uninterruptedly for the ten days I have indicated, any one interested in weather phenomena—and where is the sailor, may I ask, who is not to some extent perforce a meteorologist—must have been surprised at the readings of the barometer as published daily in the Official Meteorological Record in the metropolis.

These quotations taken every morning early at the same hour (before 6 o'clock), show readings almost uniformly high, never below 28 ins., and quite out of keeping with the sort of record to be expected in ordinary circumstances when heavy weather prevails. Take, for instance, the storm which raged on

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Saturday and Sunday the 18th and 19th January over all parts of the country. Its force was described as being almost that of a hurricane, and it was accompanied by thunder and lightning; but the barometer on the morning of the 18th in London stood at 29·85, and on the 19th had only gone down to 29·53, a reading hardly in harmony with a "howling hurricane." The lowest pressure recorded in the "Remarks" issued by the Meteorological Office, dated Monday evening, 8·30 p., was that of 28·9 ins. upon the north-west coast of Norway, where we are bound to suppose a great deal worse weather was being experienced than we had here.

On the 20th the mercury stood at 29·35, having gone down a little in London, and on the 21st it indicated a slightly higher pressure, the reading being 29·46. During the heavy weather which followed on Wednesday the 22nd and Thursday the 23rd January, the glass gave the lowest pressure on these two days respectively in the morning, at 29·20 ins. and 29·05 ins., the greatest depression being found in the north-east of Scotland, where the barometer only marked 28·8 ins. Whatever the state of the atmospheric conditions in the "Land o'Cakes," it was quite bad enough here for a much lower pressure to be recorded by the glass. Taking up the morning paper on the 24th, one finds gales and floods in large capitals, a statement that the recent strong winds culminated in a storm on Wednesday night (the 22nd) which did great damage in various parts of the country, the south coast being particularly affected by it. At the Isle of Wight, Brighton, Worthing, Eastbourne, Portsmouth, Jersey, and other places, houses were flooded, sea-walls broken down, and the ordinary means of communication interrupted, while from the sea comes a dismal record of shipwreck and loss of life. At Liverpool and on the Mersey several disasters were recorded, and the lighthouse-keepers of the Fastnet were unable to obtain their supplies of provisions owing to the terrific sea running, the tug usually employed in the duty of revictualling the beleaguered men, as well as a cutter called the *Self Reliance*, owned by McCarthy & Co., of Crookhaven, being unable to accomplish this duty on account of the weather. Telegraphic communication with France was also interrupted.

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But it would be superfluous to do more than allude in passing to the details of damage which must be in the recollection of most of our readers. The object of these remarks is to call attention to the fact that when all this hurly-burly of the elements was brewing, and while its advent ought to have been announced by our generally faithful monitor—the barometer—that instrument only gave a reading on Wednesday morning in London of 29·20 ins., which could hardly be expected to act as a very serious admonition or to indicate the approach of the "terrific gale" which ensued that night. It is true that lower pressure was reported from other places; at Carnarvon, for instance, where the reading of the barometer was stated to be but 28·4 ins., supposed to be the symbol of the heart of the storm. But had we not enough wind in London and the vicinity to warrant our expecting a lower reading there also? And if such a supposition is correct, what is the reason that the pressure on the mercury in London was higher than we ought to expect?

Again, on Saturday, the 25th January, the barometer in London stood at 29·62. On the previous day, the 24th, it noted a pressure of 29·55, while the weather was only to be described by adjectives of superlative strength. A London morning paper of Monday, the 27th, thus refers to the condition of things:—"The Gale—Serious Damage to Shipping and Loss of Life—Exciting Scenes off the Isle of Wight—A Missing Channel Steamer." The long detail of these disasters commences with the following statement:—

"In London, on Saturday night and yesterday, there was a renewal of the strong winds which have been prevalent for some days past. Fortunately, however, no serious injury appears to have been done. The wind beating against the tide kept the water in the Thames at a very low level, and therefore no accidents from flooding have to be recorded. In the country the effects seem to have been much more serious, while from round the coast reports of wrecks and consequent loss of life continue to come in."

Then follows a long detailed account of the disasters which occurred. Amongst the wrecks, however, the missing Channel steamer, the *Paris*, of the Newhaven and Dieppe line was not

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doomed to be classed, she having turned up all right after thirty-six hours knocking about in the Channel with engines broken down.

Later accounts of the gales from New York, described the tremendously heavy weather encountered by vessels of the Cunard, the National, the White Star, the North German, and other lines, with most of whom the gale commenced on the 17th of January, a day earlier than it reached us. Many vessels were reported overdue in consequence of these storms; and a long list of casualties and disasters occupied the columns of the newspapers.

I regret not being able to furnish a record of the readings of the barometer on board any of the ships which passed through this period of atmospheric disturbance at sea. It would be not only extremely interesting, but the information might be of value in directing attention to the eccentricities of barometrical pressure, if such a record could be supplemented to the following table, which shows how a London Negretti and Zambra glass was affected. The centre of the last gale of the 25th January appears to have been near Scandinavia, where the meteorological report gives the lowest reading of the barometer on Sunday (26th) at 8.30 p.m., as 28·7 ins., on the 28th the reading in London was 30·3 ins.

The following shows the London barometrical record for the period in question:—

1890.		Wind.	Weather.
January 18	29·85	S.W.	
,, 19	29·53	W.S.W.	Fresh gales with occasional storms of thunder and lightning, hail, snow, or rain.
,, 20	29·85	W.S.W.	
,, 21	29·46	W.S.W.	
,, 22	29·20	S.W.	
,, 23	29·05	S.W.	
,, 24	29·55	W.	
,, 25	29·62	W.S.W.	
,, 26	29·52	W.	
,, 27	29·65	W.	
,, 28	30·03	W.	

Glancing at the above readings one cannot fail to note the discrepancy between the pressure on the mercury and the state of

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the wind and weather, that is, judging by what experience teaches us we might expect a barometer to indicate under such conditions. Upon a former occasion in the *Nautical Magazine* (June, 1888), I called attention to somewhat similar discrepancies which also happened in the month of January of that year. Then the conditions of the atmosphere were different in the force of wind, the disturbance being signalised by dense and incessant fogs, while what winds blew were from S.W. and W., with a most remarkably high barometer.

My object was then, as it is now, to arouse a scientific curiosity as to these matters, with a view to arriving at a solution of the question why at certain seasons and places the barometer should warn for a gale that does not happen, and why at other times it should take no heed of storms which do occur.

My own idea—which I venture to put forward with great diffidence—is that the atmospheric power of raising or depressing the mercury in a barometer is affected by the amount of electricity in the air at the moment, and that to have strict reliable weather glasses, we require electric tests of the condition of the atmosphere attached to them. I came to this conclusion because the gales were attended by thunder and lightning.

To arrive at an accurate knowledge on this point a series of varied experiments should be undertaken, to carry out which I have neither the means nor the ability, nor could it be done efficiently by any private individual for many reasons; access to official records being in the first place necessary, and an authority to obtain information through the records of ship's logs, all which need Government aid to obtain. Then there is the construction of the most suitable instruments for testing the condition of the atmosphere, not by any means an insignificant portion of the proceeding. Still, if the importance of the matter be brought home to mariners in the first place, and to scientists in the second, we may soon hope to have a more perfect marine barometer than we possess at present.

I am aware that meteorological "experts" look with no friendly eye at suggestions such as I have just thrown out. "Anybody and everybody think they can write about the weather," they say.

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And no doubt when a certain system of weather reports and forecasts has become established, based like ours is, upon barometrical readings principally—taken simultaneously on the radii of a circle—it is disagreeable to be told that the whole superstructure of prophecy is built on a foundation with a serious flaw in it.

I believe I am not far out in asserting that if the Meteorological Department scores absolute success in 50 per cent. of its predictions, it is satisfied that it has deserved well of its country. I have not the report on the subject by me, and am quoting from memory and under correction when I say that 25 per cent. of the forecasts during the year 1888 were totally in error, and that only 50 per cent. were perfectly in accordance with the weather announced for the ensuing 24 hours. Under these circumstances it seems that the field is open to suggestion or even criticism, and it can only be for the interests of scientific observation that attention should be directed to these subjects.

Whether it is electricity or a peculiar condition of the atmosphere due to the influences, such as smoke and heat, arising over a great city like London that caused the barometer to mark readings not in harmony with the January gales, is the question I have put forward here, and the answer I must leave to the scientific world to furnish.

FRANKLIN FOX,
Late Captain P. and O. Service.

DO STRIKES RAISE SEAMEN'S WAGES?

IT is a moot point whether "strikes" or "unions" really raise seamen's wages. In saying so, our seamen need not jump to the conclusion that the proposition is made in order to deprecate the principle of the perfect right which they possess, of combining together in a legal and legitimate way with such an end in view. We do not dispute that at all, but simply desire to inquire into the facts in order to get at the truth. Everyone at all cognizant of the effects of "strikes" and "lockouts" knows that against a falling market they

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have only a disastrous result to the workmen. But there is a widespread opinion, notwithstanding, that Trades Unions and their operations have contributed all the benefits, which have arisen during the last 40 years or so, to the workers. Is this really so? Is there nothing due to the power of "the market"—to the principle of supply and demand—to the fluctuation of trade in general? Dr. Wells, of America, in his able work, *Recent Economic Changes*, has clearly shown that the country where "Socialism" has the least hold has conferred the most benefit on its working men in the shape of higher wages, lowest prices, and shortest work-hours. That country is England. He also says that the countries where "Socialism" is most rife press more severely on its labourers. Russia and Germany are held up as the "frightful examples" of this particular incidence. The inferences to be derived from his very searching inquiry is really that the lowering of taxation, or its more just assessment, and its freedom from monopolistic imposts, is the root cause of benefit to the working-bees in the hive of human industry. No doubt he is a strong Free Trader of the Cobden type, and his opponents will take his arguments, and his facts, with the proverbial grain of salt. But let us discard prejudice and search rigidly for the truth wherever it lies, bring it up to the light of day, and put it in the crucible of exact criticism. In doing so let us confine ourselves to the maritime element pure and simple. There is a valuable annual return of the British Government on the "Progress of Shipping," &c. In it will be found the rate of seamen's wages as far back as 1848. The following is an extract:—

ABLE SEAMEN'S WAGES PER MONTH.—BRISTOL CHANNEL TO MEDITERRANEAN.

Year.	Sail.	Steam.	Remarks.
1848	50/-	...	Depression in trade.
1849	45/-	...	Ditto.
1850	45/-	...	Ditto.
1852	50/-	...	Brisker trade.
1853	55/-	...	Revival of trade.
1854	80/-	...	Crimean war.
1855	65/-	...	Ditto.

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Year.	Sail.	Steam.	Remarks.
1856	65/-		
1857	50/-	...	Depression in trade.
1858	50/-		
1859	50/-		
1860	50/-		
1861	55/-	...	Brisker trade.
1862	55/-	...	American war. — Blockade running, &c.
1863	55/-		
1864	55/-		
1865	55/- and 60/-		
1866	55/-	...	(Commercial crisis in 1866.) Seamen's strike : Wages at Glasgow, 80/- free to 62/6 ; ditto in 1867 free to 60/- in 1880. No other port seems to have been so affected.
1867	55/-		
1868	55/-		
1869	55/-	60/-	
	55/-	65/-	
1870	55/-	60/- to 75/-	Brisker trade.
1871	55/-	67/6	
1872	75/-	65/- to 80/-	General rise owing to brisk trade.
1873	65/- to 75/-	80/-	Ditto.
1874	70/-	80/-	
1875	70/- to 80/-	80/-	
1877	70/-	75/- to 80/-	
1878	60/-	70/- to 80/-	
1879	55/-	65/- to 70/-	Depression in trade.
1880	55/-	65/- to 70/-	
1881	...	70/- to 75/-	
1882	...	75/-	Revival of trade.
1883	60/-	80/-	Brisk ditto.
1884	60/-	70/- to 80/-	
1885	60/-	70/-	
1886	55/-	70/-	Depression of trade.
1887	50/-	70/-	Ditto.
1888	50/- to 60/-	70/-	Seamen's Union formed, September, 1888.
1889	60/- to 70/-	80/- to 90/-	Revival of trade.
1890	70/-	90/-	

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In the Parliamentary return the wages are given for various trades, and from several salient divisions of the kingdom. The above selection is taken from perhaps the steadiest, if not the main, division of our foreign trade—the Mediterranean. The Bristol Channel, too, is a fair specimen, because it takes about one-sixth of the whole shipping trade of the kingdom. If, therefore, "strikes" could affect any trade permanently it would be there, more especially as the export trade, wherein wages at home are first fixed, forms a leading feature of its commerce. Now, what does the table given teach? If it teaches anything it is this: that wages have consistently followed the rise and fall of the trading cycle. In 1847 there was a "Commercial Crisis"—so called. A depression of trade followed for a period of years. Wages fell correspondingly. Then, as enterprise operated on the springs of commerce, the wages of seamen rose irrespective of any "union" or striking. The Crimean war caused an excessive demand for coal—again wages followed the impulse. The American war, combined with brisk general trade, had a similar effect. In 1872-3 the prices of commodities rose more than either before or since. There was a period of inflated trade, and wages again felt the effect for the benefit. 1883 and 1889 may be said to have taught us the same lesson. In the meantime, as soon as a "depression of trade" set in down came the seamen's wages, consequent on a fall in freights. The only exception—and it seemed to be more apparent than real—indeed it was an exception in locality as well as in time, was the seamen's strike in 1866. In the North it had a partial effect, but did not affect the South on either side of the coast. It was an inopportune time as well. It was against a falling market. 1866 was a most disastrous year—the year of the Overend-Gurney smash, when eight banks went down in one day. The wages, even in Glasgow, where they ruled in 1866 at 80/- fell to 62s. 6d. next year, and 60s. in 1868. How is it possible to keep up wages if the shipowner cannot afford to work his ship? It is a fruitless effort. Of course it may be said that generally speaking seamen are better paid now than forty years ago. Granted. But is not that the case with all trades; and is it not owing to the sounder system of modern taxation, and the great increase of

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general wealth which has spread over the whole nation? These are points worthy of the serious attention of all earnest men. Nations have gone to financial pieces solely owing to being overweighted by the non-producer. It matters not whether he is the paid servant of the State or of private societies, *e.g.*, trades unions. If the quantity of the non-productive element should outweigh that of production, all classes must suffer. The nation itself may go to ruin because its capital is thus gradually frittered away.

Such considerations are worth weighing. The idle or profitless members of the British community may be at a minimum, or little beyond it at the present time, but if the numbers are being kept piled up the effect will be simply as disastrous as the suicidal policy of maintaining profitless and immense standing armies, as seen in the case of those of the Continent.

THE STORMS OF 1889.

THE year was remarkably free from storms so far as the United Kingdom is concerned, and with two or three exceptions the gales which occurred were not severe. The disturbances frequently approached our western coasts, and often had all the appearance of passing directly across the country; but in far the majority of instances the central areas of the storm systems skirted our coasts to the westward of Ireland, and although they brought rain and unsettled weather to the British Islands generally, they seldom caused a gale except in the extreme north and west. The last three years have all been exceptionally free from gales in this country, and scarcely a gale has occurred which can lay claim to being classed with those of the first magnitude, like the gales which occurred at the close of 1886. The weather, however, of the three years has differed very considerably, and the summers of each have been about as opposite as can well be conceived. With but little exception the year 1889 experienced very seasonable weather throughout, the most marked exception being the failure of bright and warm days in July and

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August, which somewhat blighted the hopes of the farmer, which had been raised to the highest pitch by the beautiful spring weather, and the bright way in which summer opened, coupled with the almost unequalled hay-harvest over the whole country.

JANUARY was quiet and foggy. The wind was chiefly south-westerly and westerly in the north, variable in the south, and mainly north-westerly to north-easterly in the English Channel. The force of the wind was generally light to moderate, except in the extreme north-west and south-west, where moderate to fresh gales occurred frequently. At Stornoway gales were reported on 19 days, at Mallaghmore on 12 days, and at Scilly on 10 days. Leith and Yarmouth experienced no gales, and London only one. Five storm-centres passed in the vicinity of the British Islands, but not one traversed any part of the United Kingdom. The weather in the Atlantic was quiet, and transatlantic vessels experienced exceptionally few gales. A destructive cyclone occurred in the United States on the 9th, which wrecked the Suspension Bridge near Niagara Falls, and did much other damage.

FEBRUARY was stormy, especially in the early part of the month, when the gales experienced were decidedly heavy, and were more violent than at any other period during the winter. Strong gales were experienced on the 1st and 2nd, over nearly the whole of the British Islands, and heavy squalls of snow, sleet, and hail occurred. This disturbed weather was due to the arrival of a storm area from off the Atlantic, the barometer at the centre being considerably below 29 inches. A severe storm was also experienced on the 8th and 9th, the central area of the disturbance again passing to the north of Scotland, and the barometer at the extreme northern stations reading 28·6 inches. This gale was exceptionally severe over the North Sea, and was, unfortunately, accompanied by considerable loss of life. The other disturbances which occurred during the month were generally unimportant; but the track followed by the several storm centres was exceptional and almost invariably from north-west to south-east. In all, eight storm areas passed within the vicinity of the British Islands, but of these only three passed over the United Kingdom. The weather over the North Atlantic was fairly stormy at the commence-

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ment of the month on both sides of the Atlantic, but the latter part of the month was much quieter.

MARCH fully maintained its character for changeable weather. The wind was variable both in direction and force, and rather frequent gales were experienced in the north and west, but they were not severe. Very heavy floods were experienced in the western and midland districts of England, between the 6th and 8th, and upwards of three inches of rain fell at several stations during the three days. At Bristol alone the destruction was estimated at £100,000, and at Leicester several of the streets were under water to the depth of from one to five feet. Stormy weather was experienced on the 21st, the wind blowing somewhat fiercely on the south-east coast of England. During the month ten storm centres passed in the immediate vicinity of the British Islands, but only three traversed any part of the United Kingdom. Storms were frequent along the transatlantic route in the middle of the month, and off the American coasts there were several gales blowing with greatest force from directions between north-east and north-west. It is interesting to note that no icebergs were reported in the Atlantic during the month, but small quantities of field and drift ice were seen near the Newfoundland and Nova Scotian coasts.

APRIL experienced rather changeable weather, and gales were somewhat frequent. They were, however, not strong. The most frequent occurrence of gales was on the east coast of Scotland, the wind attaining the force of a gale at Aberdeen on ten days during the month. The weather was, however, exceptionally quiet in most parts of the country, and notably in the western districts, not a single gale occurring at many of the stations. There were in all four storm areas passed in the vicinity of the British Islands, and two traversed the area of the United Kingdom. The weather was very quiet during the month over the North Atlantic—but one storm area was tracked from Nova Scotia on the 2nd to the European coasts on the 9th.

MAY was mild and generally wet. Gales were almost entirely absent throughout the month, except in the south-west and west, and even there they were of little force. Of 32 stations reporting daily to the Meteorological Office, there were 19 at which the wind

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did not once reach the force of a gale. There were in all only three storm areas in the vicinity of the British Islands, and of these only one traversed England. In the Atlantic the weather was also exceptionally quiet, and vessels crossing to and from America scarcely experienced a single gale throughout the month.

JUNE was generally fine, quiet and warm. Gales were few in number, and, with the exception of the storm which broke over Kent and the English Channel on the 10th, nothing of note occurred as far as the wind is concerned. This storm, however, proved very destructive to the hops and fruit trees. Thunderstorms were frequent and severe; and the storm which occurred in London on the 6th was remarkable for the brilliant and continuous display of lightning. In the north of London 1,244 distinct flashes were counted during two hours, from nine to eleven in the evening. The thunderstorms which occurred about this time were also exceptional for the tremendous size of the hailstones which fell in different parts of England. There was only one storm centre in the vicinity of the British Islands during the month, and not one passed over any part of the United Kingdom. The weather was equally quiet in the open Atlantic; but one or two storm areas skirted the Atlantic coast of the United States.

JULY was wet and unsettled; and, owing chiefly to the marked absence of sunshine, the temperature was low for the season. The wind was generally light, and gales were few in number. In the Channel, however, the wind was stronger; and at Dungeness the force of a gale was reported on seven days. Six storm centres passed in close proximity to our coasts during the month, but only two traversed the United Kingdom, and not one passed across England. In the North Atlantic the weather was exceptionally quiet.

AUGUST was cold and wet, and the month was more stormy in character than for some time previously. A gale of moderate force was experienced on the 3rd, accompanied by a driving rain which necessitated the postponement of the Naval Review at Spithead. A brisk gale occurred over the western and southern districts on the 20th, and was unfortunately accompanied by loss of life.

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The centre of the storm area passed completely across England, and very heavy rain was experienced in nearly all parts of the kingdom. As many as nine storm areas passed in the vicinity of the British Islands, which is the second highest number in any month during the year, and of these, five traversed the United Kingdom, which is two in excess of those for any other month. The North Atlantic was comparatively free from storm areas in spite of its being the season for West Indian hurricanes. The weather throughout the month as well as during the greater part of July was most unfavourable to the harvest, and was most disheartening to the farmer, especially after the bright prospects opened out by the exceptionally favourable spring.

SEPTEMBER was very fine at the commencement of the month, but more disturbed in the latter part. For about the first fortnight the weather was more like summer than at any period either in July or August. A very heavy thunderstorm occurred on the 2nd. The latter part of the month was rather stormy, and gales were experienced in parts of the United Kingdom on the 23rd, 25th, and 28th. Five storm areas passed in the vicinity of the British Islands, but only one traversed any part of our coasts. A severe storm was experienced off the Atlantic coast of America from the 8th to 13th, when the tide rose phenomenally high, demolishing piers and sweeping away houses, and also resulting in numerous wrecks. This storm is known as the St. Thomas-Hatteras hurricane, and has been traced by the United States Hydrographic Office from the vicinity of the Barbadoes on September 1st.

OCTOBER was wet, cold, and cheerless, and the prevailing conditions of the weather were essentially autumnal. A cyclonic disturbance was situated over the North Sea on the 2nd, and on the 4th a large system of low barometer readings embraced the whole of Great Britain. Both of these disturbances caused gales on different parts of our coasts. On the 6th a rapid fall of the mercury set in on our western coasts owing to the arrival from off the Atlantic of a well marked and very deep barometrical depression. This disturbance passed across Scotland on the 7th, and gave rise to gales of exceptional violence over Ireland and the

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north-western parts of England, and the storm will be remembered by the destruction it occasioned to the Holyhead breakwater. Strong gales were also experienced on the 18th and 19th over the channel and the south of England. During the month seven storm areas passed in the vicinity of the British Islands, three of which traversed the United Kingdom, but only one passed over England.

NOVEMBER was seasonable but rather more than usually gloomy. Strong winds or gales were experienced on the 1st and 2nd in nearly all parts of our Islands, the worst part of the storm was in the north and west. This storm wrecked a carpet factory at Glasgow, and caused the death of several girls who were at work. The Portrush lifeboat also capsized during this gale, and three of the crew were lost. Strong gales were experienced in many parts of the kingdom between the 24th and 26th. In all four disturbances passed in the vicinity of the British Islands, but not one traversed England.

DECEMBER experienced considerable changes of weather, sharp frosts occurring at times, but generally the weather was mild for the season, and was for the most part excessively damp. Numerous storm areas skirted our western coasts, but none were sufficiently close for their tracks to be mapped in the vicinity of our coasts, but they were doubtless the cause of the mild weather. The gale of the 24th was about the most severe of any which occurred during the year, but it was unimportant in character.

During the year there were 62 cyclonic disturbances having their tracks in the vicinity of the British Islands, and of these only 22, or 35 per cent., actually traversed the United Kingdom, and only 14, or 23 per cent., traversed England. In 1888 there were 65 cyclonic disturbances in the immediate neighbourhood of the British Islands, and of these 26 passed over the United Kingdom, and 18 traversed some parts of England. In 1887 there were in all 68 cyclonic disturbances in the vicinity of our Islands, 20 of which passed across the United Kingdom and 13 over England. In the three preceding years the weather was more stormy, the total cyclonic disturbances being 78 in 1886, 83 in 1885, and 73 in 1884. The very quiet character of the weather

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on our coasts during the last two or three years must necessarily tell in a marked manner on the number of vessels lost in the home waters, and this is a factor which should not be overlooked in dealing with the total losses for any lengthened period.

TIDAL EFFECTS IN RIVERS.

THE semi-diurnal or more frequent flow and reflow of water in tidal rivers is a matter which, as a general effect, does not appear to be difficult of explanation. It may be described as resulting from the action upon the waters of any river accessible to the sea or to a sea-channel, of the tides of the open ocean lying at a greater or less distance beyond the river's entrance, or beyond the estuary or sea-channel into which the river discharges itself, if it be an estuary or a sea-channel which lies immediately outside its embouchure.

The manner in which the tides of the open ocean are developed has been discussed in previous numbers of this journal, where it was pointed out as a necessary inference from the explanations upon the subject given to us by astronomical experts of authority, that the tidal manifestations are not produced by the diurnal or semi-diurnal revolution round the globe of a tidal wave or volume of water. Conversely, those authoritative explanations appear to lead inevitably to the conclusion that the tides are due to the fact of the ocean bed and all sea-shores and all coasts, estuaries and channels to which the sea is accessible, being continuously brought round by the earth's rotation upon its axis, into or towards a greater or less depth of those parts of the ocean which, by the gravitating influence of the sun and moon respectively, are drawn out, or heaped up above or beyond the depth they would have but for the exercise of that influence, and if they were only subject to terrestrial gravitation.

The fresh water of every river is of course derived from off the uplands lying on either side the river's course, that is to say, it consists of the water of all the surface drainage, and of all the

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tributaries and springs flowing from within the watershed on the one side and the other of the main valley or continuous line of valleys along which the river channel has been formed. The waters of nearly all inland lakes also, are similarly derived. They comprise, in fact, in nearly every case, the waters of a main valley or line of valleys, in places where the waters become ponded back by the contraction of valley exits, aided more or less by the accumulation there of the *débris* and sedimentary materials which the stream brings down, or by the bed of the valley where the lake exists being approximately horizontal—the effect being that only the uppermost strata or portions of the stream, regarded in section vertically, overflow the lower strata and have an onward motion.

Now it is a matter which is plainly observable that no expanse of shallow water, and no part of any river or stream which by reason of distance from its embouchure, or of an abrupt or a steep declivity in its channel, or by other means, is prevented from participating in the flow and reflow of its lower waters, is appreciably affected by the solar and lunar influence in the way in which the ocean waters are thereby affected. None of the lakes of England or Scotland or Wales or Ireland, for example, exhibit tidal effects. Nor do other European lakes, such as those of Switzerland, or Italy, except, perhaps, in such a case as that of Lake Geneva, which is of very considerable depth and area, and where there are said to occur some kind of daily oscillations, or "seiches," which may probably be of a tidal character.

It is of course obvious that in their general characteristics rivers differ greatly from each other. The detailed conditions of such mighty continental waterways as the Ganges, the Mississippi, or the St. Lawrence, for example, are vastly different from those of the Rhine, the Seine, or the Thames—depending as those conditions do upon the distance and upon the contour and elevation of the regions through which a river travels, and upon other varying circumstances, including snow or rainfall, temperature and meteorological influences generally. And as to all parts of a river, whether within or above the tidal range, the velocity of the downward stream, and the slope of its surface, will be more or less determined by the magnitude or volume of its waters, and the

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declivity of its channel. With respect, however, to the part of any river within which there is a tidal rise and fall, and, in fact, with respect to its course generally, at least for some distance towards the point where there first occurs any abrupt or considerable change in the level of its bed or channel, its normal condition, as regards the vertical depth of its waters, and apart from its tidal rise and fall, must obviously be determined by the *low water level* of the outside ocean; for however great may be its volume, it is utterly insignificant as compared with the immense body of outside oceanic water towards which it descends, and which by its infinitely superior weight compels the lesser volume to conform to and to become identical with its own level or status.

Taking any time of lowest water level in the sea outside a river channel, and correspondingly in the river channel itself, the course of events would appear to be very simple. In consequence of the earth's diurnal rotation, the ocean bed beyond the river's entrance or beyond its estuary, or beyond the sea-channel into which the river is discharged, is brought round into a position where the ocean tidal-water begins to increase in depth. An inflow from the ocean towards the land commences, and meets the volume of water overflowing from the river. The river channel becomes gradually invaded by the inflowing tide, which, backed as it is by the vast and irresistible and gradually-increasing volume of water of which the ocean tidal water consists, overcomes the outward impulse of the river current, however great may be its volume. The current is turned back upon itself—its lowest stratum may still persevere in an endeavour to find the level it was previously seeking, but the mightier body of water from the sea overcomes it and occupies a continually increasing area. The fresh water of the river and the salt water from the ocean become more and more commingled, until at last the contest at the river entrance is ended. The sea water takes final possession there and reverses the river current; drives its waters back from one point to another. The conflict travels up the river channel—the waters in one reach after another are arrested and turned—the downward course of the part of the stream which has not yet been thus met, is

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retarded, and the water all along the river's tidal course rises between its banks, until after a time the downward current is altogether reversed. The increasing and resistless volume which is behind the invading stream has gained absolute sway, the river current swells up vertically in one reach after another, and ultimately flows upward along the entire tidal range, until high-water level, as determined by the high-water level of the outside ocean, is everywhere accomplished.

The outside ocean-bed having now, by the earth's diurnal rotation, been brought into a position where the solar and lunar influence upon the water is at its maximum, and where consequently the ocean tidal water has its greatest depth, it is thereupon by the same means brought under a now shallowing part of that water. Whereupon the water along the adjoining coasts, and in every neighbouring sea-channel and estuary, begins to subside. By that subsidence the water within the river's embouchure is soon affected, and by the gradual lowering of its level an outflow of the river water there commences, producing a like effect upon the water immediately above. The effect gradually travels upwards until the course of the stream along the whole tidal range of the river is at length reversed, and the ebb continues until the low water status of the outside ocean is again ultimately reached.

While such would seem to be the course of events which must obviously ensue from the action of the ocean tides upon the waters of tidal rivers, there are of course many other circumstances by which the waters within the tidal range of rivers are influenced. A primary and elementary characteristic of all bodies of water which have a free and independent onward motion of their own—that is to say, of all streams whatsoever, whether those of the open sea or those which flow through sea or river channels, or through open canals or other such artificial cuttings—is that their surface is not horizontal, but has a slope or descent of greater or less degree in the direction in which they travel, and hence their momentum, which is in fact derived from the influence of terrestrial gravitation, or from that inherent quality of all liquids not already in a state of equilibrium whereby they are impelled towards the lowest level attainable. In some cases it may be that the whole body of the

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stream, from its surface to the bed of its channel, has such a motion, when of course the stream would scour and erode its channel, and would, unless the channel were formed of the hardest rock, soon produce modifying effects by the accumulation of detritus in various parts of its course. In other instances it may be that the stream's onward motion does not extend throughout its entire depth, as in the case of lakes, whose condition as lakes is maintained by the accumulation of sediment and *débris* at the narrowed valley exits behind which the waters are in part retained, and where therefore the valley beds are not subject to those scouring operations—that is to say, where the lowermost strata of water have little or no onward motion. It is obvious also that those nethermost parts of every tidal river where the bed of the channel is below the low water level of the outside water, must be similarly retained in a more or less quiescent state. And in like manner with respect to ocean streams and currents, while some of them which travel over the shallower parts of the sea-bed may have an onward motion through their whole depth, yet having regard to the effect of gravitation generally, and to the manner in which the tides are produced, it can hardly be that the motion of the currents of the deeper seas extends to any greater vertical depth than that to which the ocean waters are appreciably affected by the solar and lunar influence—for below a certain range that influence upon the water may be considered as being entirely overcome by terrestrial gravity, which then holds almost absolute sway, and whereby the deeper waters may be said to be retained in a condition of abiding equilibrium.

Another characteristic of every stream or volume of flowing water, as it would seem to have been practically ascertained, is that, whether regarded horizontally or vertically, the several parts of the stream do not travel at the same velocity. It appears that horizontally it is the central portion of the stream which usually has the greatest velocity, and that on each side of that central portion its velocity diminishes more and more, so that near its margins its velocity is least, while taken vertically the velocity diminishes from the surface of the water downwards.

The keen sensitiveness of water to the influence of terrestrial

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gravitation, and the great complication of effects thereby produced upon the general conditions of a stream are plainly manifest in the case of every river. The greater the upland floods during longer or shorter periods of the year, the greater will be the slope of the river surface, and the greater its velocity. Wherever an impediment exists to the outward flow at any part of the surface, there does the stream become bifurcated, and for some distance past the obstruction the one general current will consist of two or more component currents running nearly parallel with each other, until they again become united, producing meanwhile eddies and all kinds of temporary variation in the onward flow of the water. By the erosion of the river banks, and by other means, sediment and *débris* is set free and becomes deposited in more or less protected situations whereby shoals and sand-banks of different forms grow up which in their turn divide the stream and alter its previous state. The form of the river channel itself—the contractedness or open-ness of its embouchure, the greater or less width of its lower reaches, and the facility there afforded by the conformation of the adjoining land, for the water to make for itself subsidiary channels of exit—the steepness or shallowness of the estuary or sea-bed beyond the river exit—supposing it to have a definite exit—and the circumstances which encourage the development of sand-banks there, and especially the variation which is continually in progress in the state of the outside tides, may also be included in the infinitude of incidents which tend to alter the state of tidal rivers and to necessitate vigilant attention on the part of hydrographic surveyors, and of pilots and navigators generally, as well as of the authorities on whom devolve the duties of lighting and buoying river channels and their approaches.

It would appear certain, then, that the ebb and flow of the water in a tidal river is not in any way the direct result of the influences which produce the open ocean tides—that is to say, of solar and lunar gravitation—and that the rise and fall of water is liable to be affected in regard to vertical height, by many varying incidents only connected with the river itself, especially as the distance from the embouchure increases. Taking the case of the Thames at London Bridge for instance, the swelling up of the

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waters through upland floods may occasion an increase there of many inches in the vertical height of the waters, and considerably enhance the slope of the entire river surface towards its lower reaches, thereby greatly quickening the stream's velocity—and probably affecting, in a greater or less degree, the time of the occurrence of high water all along the river's course. Such incidents are common to all tidal rivers, and form part of their average conditions, but they obviously have no bearing upon or connection with general tidal effects. Hence the results or figures shown by the employment of river tidal gauges can hardly be of any scientific value whatever towards elucidating general tidal phenomena, however useful they may be for marking the height of water at any moment upon the sills of docks or at other spots over which ships have to pass, or for obtaining a record of the mean or average rise and fall at any particular place for a similar purpose.

And just as the rise and fall of the water of every tidal river is produced, dynamically, by the action of the ocean tides upon the river water, so does the phenomenon called a "bore" which occurs in some parts of the world—as in the Severn, the Hoogly, and the Bay of Fundy—originate in the outside ocean. It is not in the water of the channel or river itself and apart from the outside ocean, that the effect is originated and begotten. Although the exact cause to which it is due does not appear to have been discovered, yet it is sometimes described as a "tidal wave." Most probably it is an effect of the tidal state at the time of its occurrence, of the ocean outside the channel up which the propagation of the wave, or series of waves, takes place; and that it should only occur in some few rivers or channels may arise through the position into which the channel entrance is brought by the earth's diurnal rotation with reference to the ocean tidal water, being more specially adapted by its free exposure to the open ocean or otherwise, for the inflow of such a wave than in the cases of rivers and channels wherein the phenomenon is not manifested. The occurrence of such an effect, and the fact that where it takes place the tidal rise and fall of water very considerably exceeds that manifested in other places, would seem to render the heterodox suggestion

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allowable that the general tides of the ocean, as developed over the lowermost ocean beds, where they never have been, and are hardly capable of being, accurately measured, are, possibly, of far greater magnitude than that assigned by abstruse mathematical theory and calculation. But, however that may be, it appears to be a matter for wonderment, when it is borne in mind to what potent dynamical influences the waters of the ocean, with the earth beneath and the atmosphere above them are subjected, that the opposing forces of nature should be held as they are in a state of abiding equipoise, so that only harmless and useful effects should result from their joint operation.

R. G. M. BROWNE.

SUBSTITUTES FOR DESERTERS.

SINCE the abolition of imprisonment for desertion by the Act of 1880, the offence of not joining ship after signing agreement has increased. It has become a question with shipowners as to how the part crews selected just at the point of sailing can be "warranted genuine." Four to five per cent. appears to be about the general average of those who neglect their contracts. About 200,000 men man our Mercantile Navy. Can it really be that some eight or ten thousand of our brave British tars deliberately break their contracts? As an average voyage is about three months, this serious loss means from 32,000 to 40,000 seamen running away from their ships in the United Kingdom in the course of one little year, on repeated agreements.

How sad and deplorable this is! Doubtless they were tempted to some extent, but crimping is only one phase of it. Out of a total in one district of 2,714 thei motives or excuses are tabulated thus:—

Reported themselves	...	...	...	345
Refused to proceed	...	...	...	140
Master refused to take	...	...	...	50
Too late at sailing	...	...	...	248

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Absconded :	False addresses	...	...	406
,,	Traced ...	...	...	390
,,	Not traced ...	...	...	1,135

Here we have two-thirds deliberately bolting. The others had more or less plausible excuses for not going. Some were a little groggy; others overslept themselves; some complained of the ship, or, as one of the Consuls reported of a British tar last year—he was dissatisfied because there was too much poultry served and too little beef. But of the other lot—the bad lot—the absconders—what shall be said? No doubt there is an element of crimping, but the main cause is understood to arise from "hard-ups" who eke out a make-shift existence by imposing on the simpler and decenter kind of boarding houses. There is only one remedy for such a class of fraudulent men—and that is to have a *summary penalty* for their delinquencies.

There is another feature which is worth consideration. The despatch required now-a-days for steamers does not permit the shipmaster to delay long in order to get a fitting crew. If any sort turn up at the time wanted they are taken in the absence of better. If desertion and not joining increase much it will then become a question of shipping perhaps the major part of the crew from the "rag-tag and bob-tail" of the pier-head. Will this tend to seaworthiness—to the saving of life and property? Certainly not; rather otherwise. The Board of Trade messengers have been authorised to witness the articles of such substitutes if required to do so. Well, that may tend to officialize the transaction, but it is not the witness who has to go to sea. He would be better employed hunting up a thorough good substitute for the bird that had flown. Of course, it is clearly laid down that the matter is entirely optional on the part of the captain; but we know how the tendency is to grow—it is the case in official life as well as in any other form of it. This regulation should be safeguarded, and shipowners are jealous enough of their rights to see that the danger in the rule is not incurred. That danger is the tendency to crystallize in such matters, so that by-and-bye it may be found that the vessel cannot go to sea without an official being present to engage the queue of the crew as

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substitutes, or by whatever name they may be called. The probable result will be—detention of the ship.

There is another point in this bad business of "neglecting," and that is, the invidious position in which the shipowner (for home traders) and shipmaster (for foreign traders) are placed. By section 167 of the Act of 1884 these two parties to a contract of sea articles are liable for a month's pay to the seaman if he be dismissed, and has signed within a month previous to dismissal. In other cases it is left to the Common Law and Admiralty Court to assess the damages, which in a certain contingency might be for the whole voyage.

On the other hand the seaman since the Act of 1880 has practically no liability. Hence his carelessness. The Act of 1854, section 243, imposed a fine of two days' pay and ten weeks' imprisonment. The latter was abolished by the Act of 1880 (and quite right too); but as he (the seaman) had not worked, for he had not joined, how could he be fined two days' pay? a thing he had not become possessed of. That is a nautical conundrum. The practical outcome of this topsy-turvy legislation is—that two parties make a contract, the one is penalised and the other is not. A game of heads you lose and tails I win for the sailor. The danger of the humanitarian school is that it does things without reason. It is all emotional or nothing, and hence, in remedying one injustice another is perpetrated.

The whole question requires to be threshed out by a skilful and impartial hand; and the law put on a fair basis for both parties.

CORRESPONDENCE.

MARINE NIGHT SIGNALS.

To the Editor of the "Nautical Magazine."

SIR,—There is not the least doubt that the commercial code of signals has been a great boon and help to shipping. But it is surprising that such a number of years should have elapsed without

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some simple means or method having been invented of holding communication at night. Flag signals can only be seen during the day, and even then at not a very great distance. Certainly we have the distant code, should the communication be of an important sort, but as soon as twilight sets in, both these methods become useless, and communication is not possible until the next day. For a vessel calling at a certain station for orders, this means a serious delay, and may be a loss of charter. In the case of the loss of the sailing-ship *Cherwell*, which happened last December in making the channel, the captain was for two days without observations. On the morning of the second day a vessel's lights were seen, confirming the captain that his vessel was "somewhere" on the track. At 11.30 that night his vessel struck, which resulted in the total wreck of the ship and the loss of two lives. Now, if the captain of the *Cherwell* had had any means in his power of communicating with the vessel which he saw in the morning, he would most likely have learned the correct position of his ship, and would thus have been able to navigate her from the danger.

What is wanted is an instrument cheap and simple, so simple that the youngest apprentice could handle it with the same confidence as bending on a signal of flags. The system herein described for producing night signals is the result of much thought during the dreary hours of walking the deck, by one who has felt and realised the great necessity of a simple and easily worked method for effecting communication between different ships or between the ship and the shore. This system is made by the use of a dark lantern, a little larger than, but similar to, our ordinary bull's eye lamp; the shutter by means of a spring remains closed, and is connected to a small lever or handle at the back of the lantern, so arranged that by pressing down on the handle the shutter instantly opens; the glass on the lantern should be of the dioptric kind, so as to show a good light and be able to be distinguished from the ordinary lights along a ship's deck.

The principle of the code is a short and long flash; for example, by pressing down on the handle at the back of the lantern, the shutter open, while we count one would indicate a short flash;

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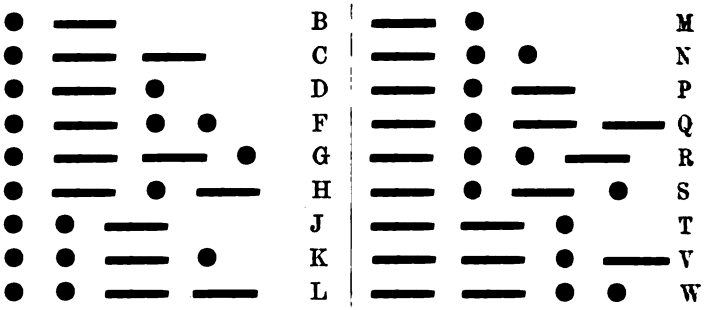
again, to make a long flash, we keep our hand on the handle of the lantern while we count six.

▬▬ denotes a long flash.

● A short flash = the answering flash.

Several short flashes repeated in succession form the call signal.

A long flash is made when a signal is not understood ; in other words, it means " Repeat your signal."



A vessel wishing to communicate with another vessel or with the shore would make a flash signal, continuing it until answered by another flash signal from the other ship. The signals made would be those of the International Code.

In submitting the above code and signal lantern for the consideration of the readers of the *Nautical Magazine*, I would observe that I trust that we shall soon find the Board of Trade adopting some means of holding communication at sea with night signals. Your obedient servant,

Liverpool, March, 1890. W. H. JONES.

BOOKS RECEIVED.

A Popular Treatise on the Winds. By Professor William Ferrel. London : Macmillan & Co. 1889.

This work comprises a description and explanation of the general motions of the Atmosphere, comprising Monsoons, Cyclones, Tornadoes, Waterspouts, Hail-storms, and other atmospheric disturbances met with in Nature. The author ays that since the middle of the present century great

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advances have been made in meteorology, especially in the study of the mechanics of the atmosphere. Before this epoch little was known even with regard to the general motions of the atmosphere, the true theory of cyclones, and such subjects as mentioned above, and the observed phenomena were mostly regarded as mysteries. Although there are still some things which require more study and further explanation, yet these subjects have now become much clearer and better understood, and so great has the change been, that the recent advances are often called the "new meteorology." The subject matter contained in this work is mostly an expansion of a series of forty lectures delivered by the author before a class of army officers of the United States Signal Service during the months of February and March, 1886. The author considers that a thorough knowledge of the principles contained in this work will be of great advantage to all who are desirous of understanding the observed phenomena and sequences of the weather, and of forming rules for weather prediction, and especially to the seaman on the ocean in the management of his vessel. For although no attempt has been made to lay down detailed rules to be followed in the various cases, yet the principles are given and explained by which each one with a knowledge of them can intelligently form his own rule in any case, which is generally much better than to blindly follow rules which can rarely be given so as to cover all cases without exception. The work is scarcely what it claims to be, "A Popular Treatise," since much of the information given is of too advanced a character to be readily understood by the ordinary navigator, unless he has been fortunate enough to have had a special mathematical training. There is, however, much which may be read with advantage, without being burdened with mathematics, and for the sailor we would recommend especially the chapters on monsoons, land and sea breezes, and cyclones.

Hurricanes in the Bay of North America. By Lieut. Everett Hayden, United States Hydrographic Office. Washington.

THE Bay of North America embraces the entire western part of the North Atlantic between Newfoundland and Venezuela, including the Caribbean Sea and Gulf of Mexico. The author does not deal

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very especially with the hurricanes in the region defined in the title of the paper, but gives a description of hurricanes and cyclones generally, quoting Padre Viñes, Ferrel, Faye, Blanford, and Buchan. He recommends the more general use of information to be obtained of a distant storm from the long rolling swell which it causes along the coast. With respect to the importance of taking advantage of every possible method of obtaining and circulating early and reliable information of approaching storms, reference is made to the cable which is about to be laid from Halifax to Bermuda, which it is felt will add a most important station, and it is recommended that a line should be extended to Nassau, which is perhaps an equally important point.

The Modern Law of Storms. By Lieutenant Everett Hayden, United States Hydrographic Office. Washington.

The author describes the "Law of Storms" as a code of rules or directions for manœuvring a vessel so as to avoid the centre, or most dangerous portion, of a storm, and, as a secondary consideration, to take advantage of its favourable winds to prosecute the voyage. A rough sketch is given of the old rules as propounded by Reid, Piddington, Thorn, and others, and surprise is expressed at the apparently slight progress made in the past fifty or sixty years. Referring to the use of the eight-point rule, as a guide to the bearing of the centre of a hurricane, it is recommended that it should be applied to the low clouds and not to the wind. Special importance is also attached to the statement that in the rear of a hurricane the wind is still more strongly incurved, blowing almost directly towards the receding storm; here a ten-point or twelve-point rule is therefore recommended as a safer guide, whether applied to the low clouds or to the wind. Some of the most recent rules by Meldrum and Abercromby are quoted by the author, who also quotes Huxley as having said that "Science commits suicide when it adopts a creed;" and he adds that certainly the master of a vessel who blindly follows a thumb-rule in navigation is liable, if not to commit suicide, at least to die a violent death. The fact being here, as elsewhere, that we cannot eliminate brains as a factor in our every-day life. As an addition to the law of storms, it is asserted that there is abundant testimony

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to warrant the rule: Use oil to prevent heavy seas from breaking on board your vessel.

Revival of Trade. By William Turner, F.S.S. London: Elliot Stock. 1890.

Mr. Turner has apparently given the whole question of the fluctuations of trade very careful consideration. In the pamphlet before us he states his conclusions that the depressions and panics in the commercial world are mainly caused by fictitious and unhealthy enterprises brought out during periods of flourishing trade, which in time collapse, and public confidence being thereby severely shaken, capital is withheld for a time from sounder commercial undertakings. Again he recognises over-production in any industry as a potent cause of stagnation in the movement of capital, resulting in a depression of trade until consumption overtakes production. Mr. Turner's *brochure* is written in a lively style, and is well worth perusal by all interested in commerce and by political economists. His statistics are very carefully prepared, and are full of interest. Now that the trading community are enjoying a period of "revival," it would be well if they would study the facts and opinions expressed in this pamphlet; they would find much matter for useful reflection, and possibly might be warned off some of the shoals and quicksands of commercial speculation which with a fair wind and tide are too apt to be unheeded.

Aide-Memoire de l'Officier de Marine. Par Edouard Durassier. Bibliothécaire du Ministère de la Marine. 4c. Année. Paris: L. Baudoin et Cie, Rue et Passage Dauphine 30. 1890.

This little book is intended to be of service to French naval officers, and no doubt it will in many cases be useful to them. The contents may also be made equally serviceable for possible prospective enemies, and may with advantage be consulted by naval officers of other countries. It contains a valuable statement of the operation of International Law in time of peace as well as of war; gives the details of armament and *personnel* of the navies of all nations; shows how the coasts of each maritime country are defended, and indicates the routes of submarine telegraph cables in all parts of the ocean. We are glad to possess a volume so useful for reference purposes.

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Pilot Chart of the North Atlantic for March. Washington, U.S.

ATTENTION was called in the *United States Pilot Chart for February* to the unusually early and heavy southward movement of ice off the Grand Banks this season, and the timely warning given to navigators has been fully justified by the many reports since received. During January there seems to have been more ice than ever before reported for that month, and this has been the cause of considerable delay and damage to vessels that did not avoid it by taking a safe route well to the southward. It is shown that there are not only vast fields of ice, but also a very large number of bergs, and the latter occasionally of enormous dimensions. An effort is being made by the United States Hydrographic Office to obtain as much information as possible regarding the general ice movement during the present and past seasons with a view to the accurate prediction of ice movements for each particular season. Means are also being taken to induce the Government of Canada to take such steps as they may deem desirable to obtain a thorough knowledge of the currents in the Gulf of St. Lawrence and adjacent waters, on account of their dangerous character during thick weather. It is thought that the serious loss of life and property due to shipwrecks attributable to unknown currents during fogs or hazy weather may thus be greatly diminished. The *Pilot Chart* shows that the weather in the North Atlantic during February was much more moderate than during the two months immediately preceding. An area of very high barometer extended over nearly the entire length of the transatlantic steamship routes until the 8th, but afterwards gales of varying force were experienced from time to time. A few fog-banks were reported during the month, but none of them were of great extent, except that which prevailed during the 24th, 25th, and 26th along the American coast from Boston to Norfolk.

Kurze Azimuth-Tafel für alle. Deklinationen., Stundenwinkel und Höhen der Gestirne auf Veliebigen Breiten, &c., &c. Entworfen von Dr. G. D. E. Weyer. Hamburg: L. Friederichsen & Co.

THESE brief azimuth tables for all declinations, hour angles, and

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altitudes of heavenly bodies in any latitude are by Dr. G. D. E. Weyer, Professor of Mathematics and Astronomy in the Kiel University. We are not wholly unacquainted with approximately similar tables in England, but we certainly prefer those of the German professor, and when a work from him reaches us we are sure to have the investigation of the problem, together with its history and transformation in the progress of time.

Revue Maritime et Coloniale (Paris) for February, continues the excellent article on Oceanography by Prof. J. Thoulet.

Mittheilungen aus dem Gebiete des Seewesens (Pola), Vol. XVIII., No. I. and II., among its choice selection of papers and notices translates Staff-Commander E. W. Creak's excellent lecture recently delivered before the Royal United Service Institution.

Handy Lists of Technical Literature, compiled by H. E. Haferkorn and Paul Heise, Milwaukee, Wis. (London: B. F. Stevens), is a *capitally* compiled reference catalogue of books in English published between 1880 and 1888, relating to all departments of military and naval science, navigation, yachting, tactics, &c., &c.

OFFICIAL RETURN OF BRITISH WRECKS IN FEBRUARY, 1890.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of February, 1890, and the number of lives lost, are as follows:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	56	16,780	149
Steam	10	8,851	97
Total	66	25,631	246

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in February relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—THOMAS GRAY, Assistant-Secretary, Marine Department.—Board of Trade, 1st March, 1890.

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TIDE TABLES FOR APRIL, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	LONDON BRIDGE.		HULL.		NORTH SHIELDS.		LEITH.		DEVONPORT.		DOVER.		WESTON-SUPER-MARE.		LIVERPOOL.		GREENOCK.		QUEENSTOWN.		KINGSTOWN.		LONDONDERRY.		BREST.	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
Tu	1	11 38	—	3 50	4 21	0 55	1 28	—	0 17	2 30	3 6	8 31	8 58	3 58	4 29	8 55	9 19	9 29	9 56	2 20	2 47	8 41	9 8	5 41	6 1	1 16	1 48
W	2	0 10	0 36	4 46	5 7	1 40	2 6	0 41	1 0	3 37	4 3	9 21	9 42	4 56	5 20	9 40	9 59	10 19	10 39	3 11	3 33	9 32	9 53	6 57	6 39	2 4	2 23
Th	3	0 56	1 16	5 25	5 42	2 24	2 41	1 18	1 35	4 26	4 47	10 1	10 19	5 41	6 0	10 16	10 32	10 58	11 16	3 52	4 10	10 10	10 25	6 57	7 14	2 41	2 57
F	4	1 34	1 51	5 58	6 15	2 56	3 11	1 52	2 8	5 6	5 24	10 36	10 53	6 19	6 37	10 48	11 4	11 34	11 52	4 27	4 44	10 40	10 55	7 31	7 48	3 18	3 29
S	5	2 9	2 24	6 32	6 49	3 26	3 42	2 24	2 40	5 42	6 0	11 11	11 29	6 55	7 12	11 20	11 36	—	0 9	5 1	5 18	11 10	11 26	8 4	8 19	3 45	4 2
S	6	2 38	2 54	7 6	7 23	3 58	4 15	2 55	3 11	6 18	6 36	11 47	—	7 29	7 46	11 53	—	0 26	0 43	5 35	5 52	11 43	mid.	8 34	8 49	4 19	4 36
M	7	3 9	3 26	7 40	7 57	4 32	4 49	3 27	3 44	6 53	7 9	0 5	0 24	8 3	8 19	0 10	0 28	1 0	1 17	6 9	6 27	—	0 18	9 4	9 20	4 53	5 10
Tu	8	3 44	4 1	8 14	8 32	5 7	5 25	4 1	4 19	7 25	7 42	0 44	1 4	8 36	8 54	0 46	1 4	1 35	1 53	6 45	7 4	0 36	0 54	9 37	9 55	5 27	5 45
W	9	4 19	4 38	8 50	9 9	5 44	6 4	4 38	4 58	8 0	8 18	1 24	1 45	9 12	9 30	1 22	1 41	2 12	2 31	7 24	7 44	1 13	1 33	10 14	10 34	6 4	6 24
Th	10	4 56	5 15	9 30	9 52	6 25	6 48	5 20	5 43	8 37	8 57	2 6	2 28	9 48	10 7	2 1	2 22	2 51	3 11	8 4	8 25	1 54	2 17	10 57	11 25	6 46	7 10
F	11	5 37	6 1	10 15	10 43	7 13	7 42	6 9	6 37	9 20	9 44	2 51	3 16	10 27	10 51	2 44	3 9	3 33	3 58	8 48	9 15	2 42	3 10	11 58	—	7 36	8 5
S	12	6 28	6 57	11 17	11 58	8 16	8 55	7 10	7 49	10 12	10 48	3 44	4 15	11 21	11 58	3 38	4 14	4 27	5 0	9 45	10 22	3 42	4 19	0 40	1 25	8 39	9 18
S	13	7 31	8 10	—	0 42	9 39	10 26	8 32	9 19	11 21	—	4 49	5 27	—	0 40	4 56	5 44	5 38	6 21	11 6	11 52	5 0	5 44	2 15	3 3	10 2	10 51
M	14	8 56	9 46	1 26	2 8	11 12	11 54	10 5	10 47	0 7	0 56	6 9	6 52	1 26	2 12	6 34	7 21	7 7	7 51	—	0 37	6 28	7 8	3 46	4 23	11 30	—
Tu	15	10 32	11 12	2 48	3 26	—	0 31	11 25	11 58	1 42	2 26	7 33	8 10	2 56	3 37	8 1	8 35	8 32	9 9	1 20	2 0	7 46	8 21	4 54	5 21	0 21	0 56
W	16	11 48	—	4 0	4 30	1 8	1 50	—	0 24	3 4	3 36	8 42	9 10	4 14	4 46	9 3	9 28	9 41	10 8	2 33	3 1	8 52	9 21	5 45	6 8	1 27	1 58
Th	17	0 18	0 48	4 55	5 17	1 54	2 16	0 48	1 11	4 8	4 28	9 35	9 58	5 14	5 39	9 51	10 12	10 32	10 55	3 25	3 48	9 45	10 5	6 31	6 53	2 16	2 37
F	18	1 8	1 29	5 38	5 59	2 36	2 55	1 33	1 53	4 53	5 14	10 20	10 42	6 3	6 25	10 32	10 52	11 17	11 39	4 10	4 31	10 24	10 43	7 14	7 35	2 57	3 17
S	19	1 49	2 9	6 20	6 40	3 14	3 33	2 13	2 32	5 34	5 54	11 4	11 25	6 46	7 6	11 12	11 32	—	noon	4 52	5 12	11 2	11 21	7 55	8 13	3 37	3 56
S	20	2 28	2 46	7 0	7 19	3 52	4 11	2 50	3 8	6 14	6 33	11 45	—	7 26	7 44	11 51	—	0 20	0 39	5 33	5 51	11 40	11 58	8 30	8 47	4 15	4 33
M	21	3 5	3 24	7 38	7 56	4 30	4 48	3 26	3 43	6 50	7 5	0 5	0 25	8 1	8 18	0 9	0 27	0 58	1 17	6 9	6 27	—	0 16	9 8	9 19	4 51	5 9
Tu	22	3 41	3 59	8 14	8 31	5 6	5 24	4 0	4 18	7 21	7 37	0 45	1 4	8 36	8 51	0 45	1 3	1 35	1 52	6 45	7 2	0 34	0 52	9 35	9 51	5 26	5 43
W	23	4 17	4 34	8 48	9 5	5 42	6 0	4 36	4 54	7 52	8 7	1 22	1 40	9 7	9 22	1 20	1 36	2 9	2 26	7 19	7 36	1 10	1 28	10 8	10 26	6 0	6 17
Th	24	4 52	5 9	9 23	9 41	6 18	6 37	5 12	5 32	8 22	8 37	1 58	2 17	9 37	9 58	1 53	2 11	2 43	3 0	7 58	8 11	1 47	2 6	10 45	11 8	6 35	6 55
F	25	5 27	5 47	10 1	10 24	6 57	7 21	5 54	6 18	8 53	9 11	2 37	2 58	10 10	10 29	2 30	2 51	3 19	3 40	8 31	8 52	2 27	2 50	11 37	—	7 17	7 41
S	26	6 8	6 32	10 51	11 22	7 49	8 20	6 44	7 14	9 31	9 55	3 20	3 44	10 50	11 17	3 14	3 41	4 8	4 28	9 15	9 42	3 16	3 45	0 10	0 46	8 7	8 37
M	27	6 50	7 29	11 58	—	8 55	9 34	7 48	8 26	10 24	10 58	4 11	4 42	11 50	—	4 18	4 50	4 57	5 31	10 16	10 54	4 16	4 54	1 26	2 10	9 12	9 51
Tu	28	7 50	8 46	0 36	1 14	10 14	10 54	9 7	9 49	11 40	—	5 16	5 58	0 28	1 9	5 32	6 16	6 9	6 49	11 35	—	5 32	6 11	2 51	3 30	10 33	11 15
W	29	8 59	10 10	1 52	2 28	11 33	—	10 27	11 1	0 24	1 7	6 31	7 7	1 50	2 28	6 58	7 35	7 29	8 6	0 10	0 54	6 48	7 22	4 5	4 35	11 54	—
Th	30	10 47	11 19	3 2	3 33	0 8	0 38	11 31	11 57	1 47	2 23	7 41	8 10	3 3	3 35	8 7	8 34	8 40	9 3	1 28	1 57	7 58	8 20	5 0	5 20	0 28	0 55

TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* − *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−3 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 18	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+3 8	Brest
Boulogne	+0 13	Dover
Bridport	+0 2½	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadix	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 37	Dover
Campbelltown	−0 28	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bay	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 57	Londonderry
Coquet Road	−0 23	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 56	Dover
Exmouth	+0 38	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 12	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 58	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 58	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 3	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 48	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 18	Devonport
Peterhead	−1 48	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 33	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 22	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 8	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 22	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+2 20	Queenstown
Whitby	+0 22	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 43	London
Youghall	+0 18	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt. = Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
149	English Channel—Caskets	Intensity of flashes to be improved.
150	„ St. Catherine's Point	Red sector to be introduced.
151	England—East Coast—Kentish Knock and Longsand Lightships	To be altered in position.
152	„ River Thames—Four Fath. Chan.—Middle Ground	Beacon disappeared.
153	„ East Coast—Hartlepool Bay—Longscar	Bell-buoy altered in position.
154	„ Bristol Chan.—English and Welsh Grounds	Light and fog-signal altered in character.
155	Ireland—Cork Harbour—Dogsnose Point	Buoy to be altered.
156	Norway—S.W. Coast—Tananger	New light.
157	„ „ Vistnæstangen	New light.
158	„ „ Smörstak	New light.
159	„ „ Hvidingsö	Light altered in character.
160	„ West Coast—Karmö—Marö	New light.
161	„ „ Haugesund—Sorhangö	Intended red sector.
162	„ „ Yttre Fiord—Hammersund	New light.
163	Baltic—Russia—Cape Steinort	Lighthouse altered in colour.
164	„ Gulf of Finland—Revel—Katerindal	Lighthouse altered in colour.
165	„ „ Hangö Road—Russer En Is.	Particulars of fog-signals.
166	Mediterranean—France—Camargue or Faraman	Arc of visibility of provisional light.
167	„ Italy—St. Andrea Is. and Cape Sta. Maria di Leuca	Sectors of red light.
168	Red Sea—Suez Bay—Kadd el Marakeb	Buoy altered in character.
169	„ Straits of Bab el Mandeb—Zi Hill	Shoal to southward.
170	Bay of Bengal—Balasor River—Chandipur	Light to be re-exhibited.
171	„ „ Aracan River—Savage Is.	Re-exhibition of permanent light.
172	Eastern Archipelago—Java—Batavia	Alteration in lights.
173	„ „ Gillolo Is.—Gam Sungi Road	Shoal discovered.

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MONTHLY ABSTRACT OF NAUTICAL NOTICES—*Continued.*

No.	PLACE.	SUBJECT.
174	CHINA SEA—Tong King Gulf—Hainan Is.—Leong Soi Pt.	Reported shoal ground.
175	CHINA—Chusan Arch.—Loka Is.	Permanent light established.
176	„ Yang tse Kiang—Kiu Toan Light-vessel	Decreased depths to N.W.
177	JAPAN—Inland Sea—Takami Sima	Depth on shoal to eastward.
178	„ Isumi Strait—Tomangai Sima	Provisional light.
179	„ Yezo Is.—Go Yo Mai Chan.	Sunken rock in fairway.
180	NEW GUINEA—North Coast—Mofia Is.	Shoal to southward.
181	„ South Coast—Round Head	Reef reported to southward.
182	AUSTRALIA—Inner Route—Howick Group—Harrington Rock	Does not exist.
183	NORTH AMERICA—Vancouver Is.—Ou Ou Kinsh Inlet	Rock awash in fairway.
184	SOUTH AMERICA — Tierra del Fuego—Bailey Is.	Mission station and refuge.
185	WEST INDIES—Trinidad—Galera Pt.	Shoal to eastward.
186	UNITED STATES—Delaware Breakwater	Fog-signal discontinued at front light-station.
187	„ Massachusetts—Boston Harb.—Nicks Mate	Light-buoy withdrawn.
188	NOVIA SCOTIA—Beaver Is. and Egg Is.	Intended alteration in character of lights.
189	BAY OF FUNDY—New Brunswick—Cumberland Basin—Ward Pt.	New light.
190	GULF OF ST. LAWRENCE—Nova Scotia—Pictou Harb.	Additional leading lights.
191	„ „ Prince Edward Is.—Charlottetown Harb.	Additional leading lights.
192	„ „ New Brunswick—Chaleur Bay—Salmon Pt.	New light.

NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

149.—ENGLISH CHANNEL.—*Improved Light at the Caskets Light-house.*—On or about the 15th September, 1890, the *intensity of the flashes* of the light at the Caskets during hazy and thick weather will be more than *doubled*. The distinctive character of the light, *i.e., three flashes in quick succession every half-minute*, will remain as heretofore. Further notice will be given.

150.—ENGLISH CHANNEL.—*Red Sector of Light at St. Catherine's Point Lighthouse, Isle of Wight.*—Towards the end of August, 1890, it is intended, with a view of warning vessels when approaching too closely to the shore, to alter the colour of the light at St.

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Catherine's point, Isle of Wight, between the bearings of N. 53¼° W. and N. 43¼° W. from the lighthouse, so that over this arc the flashes of the main white light will show *red*, whilst a powerful *fixed red* light will also be visible between the flashes. Further notice will be given.

151.—ENGLAND.—*East Coast.—Alteration in Position of the Kentish Knock and Longsand Light-Vessels, and Longsand Head Bell-Buoy.*—Consequently on the surveys which have recently been made of these shoals, it is intended towards the end of the month of June, 1890, to shift the positions of the above-mentioned sea marks as follows:—(1.) *Kentish Knock Light-Vessel* will be moved about one mile west of her present position, and will then be distant about $2\frac{3}{10}$ths miles from the five-fathom line of the shoal. (2.) *Longsand Head Light-Vessel* will be moved about one mile west of her present position, and will then be distant about $2\frac{3}{10}$ths miles from the five-fathom line of the shoal. (3.) *Longsand Head Bell-Buoy* will be moved about four cables west of its present position, and will then be distant about six cables from the five-fathom line of the shoal. Further particulars will be given.

152.—ENGLAND.—*River Thames.—Four-Fathoms Channel.—Middle Ground Beacon.*—Information has been received that this beacon has disappeared.

153.—ENGLAND.—*East Coast.—Hartlepool Bay.—Longscar Bell-Buoy.—Alteration in Position.*—The present position of the Longscar bell-buoy, being found to be unsatisfactory (see Notice to Mariners, No. 43, 14th December last), it is intended shortly to replace the buoy near its former position, of which marks and bearings will be published when the change has been made.

154.—ENGLAND.—*Bristol Channel.—Alteration in Character of the Light and Foy-Signal of the English and Welsh Grounds Light-Vessel.*—In reference to Notice 98, p. 243, the changes on board the English and Welsh Grounds light-vessel have been carried into effect, viz.:—The light is now *one white flash every thirty seconds*, instead of every minute as formerly. Also the vessel has now a fog-horn, which will sound in thick or foggy weather *two blasts* (*high-low*) in quick succession every *two minutes*.

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155.—IRELAND.—*South Coast.—Cork Harbour.—Buoy N.W. of Dogsnose Point.—Intended Alteration in Character.*—The following alteration is about to be made in the character of the buoy moored about two cables N.W. of Dogsnose point, eastern side of entrance to Cork harbour:—The buoy (conical, black) off Dogsnose point will be surmounted by a short staff and globe painted black.

156.—NORWAY.—*S.W. Coast.—Light on Tananger.*—With reference to notice in 1889, on the intended exhibition of a light at Tananger, on 1st March, 1890, the light would be exhibited. Tananger light, situated on Havnetangen, northern side of Tananger inlet, is a *fixed red* light, visible from the bearing of S. 38° E., through north, to N. 72° W.; it is elevated 46 feet above the sea (10 feet above the ground), and should be seen from a distance of 4 miles. Position, lat. 58° 55′ 50″ N., long. 5° 34′ 50″ E. *Variation*, 15° *W.* This light, not constantly attended to, will be exhibited annually from 1st August to 15th May.

157.—NORWAY.—*S.W. Coast.—Alternating Light on Vistnæstangen.*—With reference to notice in 1889, on the intended exhibition of a light on Vistnæstangen, on 1st March, 1890, the light would be exhibited. Vistnæstangen light, situated on south Vistnœstange, is an *alternating red and white* light, visible from the bearing of S. 4° E., through east, to N. 38° W.; it is elevated 36 feet above the sea (10 feet above the ground), and should be seen from a distance of 6 miles. Position, lat. 58° 58′ 50″ N., long. 5° 34′ 15″ E. *Variation*, 15° *W.* This light, not constantly attended to, will be exhibited annually from 1st August to 15th May.

158.—NORWAY.—*S.W. Coast.—Alternating Light on Smörstak.*—With reference to notice in 1889, on the intended exhibition of a light on Smörstak, Karm sound, on 1st March, 1890, the light would be exhibited. Smörstak light, situated on the south end of Lövö, is an *alternating red and white* light, visible from the bearing of S. 56° E., through north, to N. 80° W.; it is elevated 35 feet above the sea (10 feet above the ground), and should be seen from a distance of 6 miles. Position, lat. 59° 14′ 50″ N., long. 5° 22′ 10″ E. *Variation*, 15° *W.* This light not constantly attended to, will be exhibited annually from 1st August to 15th May.

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159.—NORWAY.—*S.W. Coast.—Hvidingsö Light.—Intended Alteration in Character.*—On 1st July, 1890, the following alteration will be made in the character of Hvidingsö light. Hvidingsö light will be an *occulting* light with one short eclipse *every fifteen seconds*. Position, lat. 59° 3′ 40″ N., long. 5° 24′ 25″ E. *Variation*, 15° *W.*

160.—NORWAY.—*West Coast.—Karmö.—Occulting Light on Marö.*—With reference to notice in 1889, on the intended exhibition of a light on Marö, western side of Karmö, by further notice on 3rd Februray, 1890, the light was exhibited. Marö light is an *occulting* light, showing *red* from the bearing of S. 14° W. (leading westward of Kvittingskjær) to S. 5° E. (leading westward of Dybaalen); *white* from S. 5° E. to S. 29° E.; and again *red* from S. 29° E., through east, to N. 23° E. It is elevated 39 feet above the sea (10 feet above the ground), and visible from a distance of 6 miles. Position, lat. 59° 16′ 40″ N., long. 5° 11′ 20″ E. *Variation*, 15° *W.* This light, not constantly attended to, will be exhibited annually from 1st December to 31st March.

161.—NORWAY.—*West Coast.—Haugesund Entrance.—Sorhaugö Lighthouse.—Intended Sector of Red Light.*—On 1st July, 1890, a sector of *red* light will be shown from Sorhaugö lighthouse, northern entrance to Haugesund. A sector of *red* light will be shown from Sorhaugö lighthouse from the bearing of S. 62° E. to S. 69° E., over Vestre Skolten, which has 3 fathoms water on it. Position, lat. 59° 25′ 25″ N., long. 5° 14′ 45″ E. *Variation*, 15° *W.*

162.—NORWAY.—*West Coast.—Yttre Fiord.—Alternating Light at Hammersund.*—With reference to notice in 1889, on the intended establishment of a light at Hammersund, southern shore of Yttre fiord, by further notice on 20th February, 1890, the light was exhibited. Hammersund light, situated on Ring holm, is an *alternating* light, visible from the bearing of S. 64° W. (leading northward of the shoals off Vedö), through south, to S. 88° E. (leading northward of Lindvaagssortna); also towards Hammersund. It is elevated 26 feet above the sea (10 feet above the ground), and should be seen from a distance of 6 miles. Position, 63° 12′ 10″ N., long. 7° 57′ 55″ E. *Variation*, 14° *W.* This

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light, not constantly attended to, will be exhibited annually from 1st August to 15th May.

163.—BALTIC.—*Russian Coast.—Cape Steinort Lighthouse.—Alteration in Colour.*—The northern and southern sides of cape Steinort lighthouse are painted dark red, and the western side white.

164.—BALTIC.—*Gulf of Finland.—Revel.—Katerindal Lighthouse.—Alteration in Colour.*—The following alteration has been made in the colour of Katerindal lighthouse, Revel:—Katerindal lighthouse is painted white, dome green.

165.—BALTIC.—*Gulf of Finland.—Hangö Road.—Russer En Island.—Particulars of Fog-Signals.*—The fog-signals on Russer En island, western shore of Hangö road, are made as follows:—On Russer En island, in thick or foggy weather during the winter, two guns are fired in quick succession *every fifteen minutes*, for the steam packets; during the summer, the fog-bell is sounded.

166.—MEDITERRANEAN.—*France.—Camargue or Faraman Provisional Light.—Arc of Visibility.*—With reference to notice in 1889, on the exhibition of a provisional light at Camargue or Faraman, pending alterations in the permanent light; on 30th March, 1890, Camargue or Faraman provisional light (group flashing white) would be visible through an arc of 215°, or from the bearing of N. 76° W., through north, to S. 41° E., so as to be seen from the outer part of the gulf of Saintes Maries. Position, lat. 43° 20′ 40″ N., long. 4° 41′ E. *Variation*, 14° *W.*

Note.—The small *red* light formerly shown from Camargue or Faraman lighthouse, below the principal light, is permanently discontinued.

167.—MEDITERRANEAN.—*Italy.—S.E. Coast.—St. Andrea Island and Cape Sta. Maria di Leuca Lighthouses.—Sectors of Red Light.*—With reference to notice in 1889, that sectors of *red* light were being established at St. Andrea island and cape Sta. Maria di Leuca lighthouses, S.E. coast of Italy. By further notice, on 1st March, 1890, the following sectors would be established:—The sectors established at St. Andrea, and cape Sta. Maria di Leuca lighthouses are to mark Ugento shoal, and the character of the *red* light of the two sectors is identical with that of the

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respective lights, viz.—St. Andrea *fixed and flashing every minute*, and cape Sta. Maria di Leuca *fixed and flashing every half-minute*.

St. Andrea Island.—The sector of *red* light is shown from the bearing of N. 14° W. to N. 25° W. Position, lat. 40° 2′ 50″ N., long. 17° 57′ 10″ E.

Cape Sta. Maria di Leuca.—The sector of *red* light is shown from the bearing of S. 81° E. to S. 61° E. Position, lat. 39° 47′ 45″ N., long. 18° 22′ 30″ E. *Variation*, 8° *W.* The outer limits of the two sectors intersect at a point with Ugento shoal beacon bearing N. 67° E., distant $3\frac{8}{10}$ths miles.

168.—Red Sea.—*Gulf of Suez.—Suez Bay.—Kadd el Marakeb Buoy.—Alteration in Character.*—On 1st March, 1890, the following alteration will be made in the character of the buoy (at present surmounted with staff and ball) marking the extremity of the spit extending off Kadd el Marakeb, eastern shore of Suez bay:—Kadd el Marakeb buoy will be a gas lighted buoy, showing a *fixed white* light, visible from a distance of at least 2 miles.

169.—Red Sea.—*Straits of Bab el Mandeb.—Eastern Shore.—Shoal Southward of Zi Hill.*—The commander of the Eastern Telegraph Company's steam-vessel *Chiltern* has reported the existence of a shoal lying about 6¾ miles southward of Zi hill, eastern shore of straits of Bab el Mandeb. A shoal, about three-quarters of a mile in length in a N.W. and S.E. direction, lies with Zi hill bearing N. 7° E., distant about $6\frac{3}{4}$ miles; a depth of 3 fathoms was obtained on the northern part of the shoal. The southern part was not sounded over, and there may be less water. Position, lat. 12° 50′ 35″ N., long. 43° 24′ 35″ E. (marked 3 fathoms, and possibly less water). *Variation*, 4° *W.* There is a depth of 7 or 8 fathoms eastward of the shoal, and about 5 fathoms on the western side.

170.—Bay of Bengal.—*Orissa Coast.—Balasor River Entrance.—Chandipur Light.—Intended Re-Exhibition.*—With reference to notice in 1889, on intended alterations in the light exhibited from Chandipur flagstaff, south side of Balasor river entrance, by further notice, on 1st May, 1890, the light will be re-exhibited with new illuminating apparatus. Chandipur light will be a *fixed white* light, visible from the bearing of N. by E., through west, to W. by S.,

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elevated 62 feet above H.W., and should be seen from a distance of 10 miles. Illuminating apparatus dioptric, or by lenses, of the sixth order. Position, lat. 21° 26′ N., long. 87° 2½′ E. *Variation*, 3° *E.*

171.—Bay of Bengal.—*Eastern Shore.—Arakan River Entrance.—Savage Island.—Re-Exhibition of Permanent Light.*—With reference to notice in 1889, on intended alterations in Savage island light, south side of Arakan river entrance, and exhibition of provisional light pending such alterations, on 27th January, 1890, the permanent light would be re-exhibited. The light on Savage island is a *fixed and flashing* white light *every minute*, obscured from the bearing of N.N.E., through east, to E.S.E., elevated 118 feet above H.W., and visible from a distance of about 17 miles. Illuminating apparatus dioptric, or by lenses of the first order. The lighthouse is 70 feet in height. *Variation*, 3° *E.*

172.—Eastern Archipelago.—*Java.—North Coast.—Batavia, Western Approach. — Alterations in Lights.* — With reference to Notice 120, p. 250, on intended alterations in certain lights, western approach to Batavia, by further notice, on 1st March, 1890, lights would be exhibited on Babi and Payung islands :—

(1.) A light, shown from the south extreme of Babi island, is a *fixed white* light of the fifth order, elevated 59 feet above H.W., and visible from a distance of 13 miles. The lighthouse, 53 feet high, is constructed of iron framework, and painted white ; the keeper's dwelling near, is white with red roof. Approximate position, lat. 5° 49′ S., long. 106° 17′ E.

(2.) A light, shown from the south extreme of Payung island, is a *fixed* white light of the fifth order, elevated 59 feet above H.W., and visible from a distance of 13 miles. The lighthouse, 53 feet high, is constructed of iron framework and painted white ; the keeper's dwelling near, is white with red roof. Approximate position, lat. 5° 49¼′ S., long. 106° 33¼′ E. Also, on the exhibition of the above lights on Babi and Payung islands, the lights (*fixed* white) on Merak and Great Kombuis islands would be discontinued, and the lighthouses pulled down. Position of Merak island light-house, lat. 5° 56¼′ S., long. 105° 58½′ E. Position of Great Kombuis lighthouse, lat. 5° 55½′ S., long. 106° 34¼′ E.

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173.—Eastern Archipelago.—*Gillolo Island.—East Coast.—Shoal in Gam Sungi Road.*—The master of the Netherlands Government steam-vessel *Havik* has reported the existence of a shoal in Gam Sungi road, east coast of Gillolo (Halmaheira) island. A coral shoal extending in a N.W. and S.E. direction, with a depth of 2 fathoms, lies near the anchorage in Gam Sungi road, with the following bearings:—East extreme of bay, E. by N ¼ N.; West extreme of bay, W. by N. ¾ N.; Flagstaff, N.N.W. ¼ W. Position, lat. 0° 10′ N., long. 128° 47′ E. *Variation*, 2° *E.*

174.—China Sea.—*Tong King Gulf.—Hainan Island.—S.E. Coast.—Reported Shoal Ground South-Eastward of Leong Soi Point.*—The captain of the French armoured ship-of-war *Turenne*, has reported the existence of two shoals off Leong Soi point:—(1.) Approximate position of a shoal, on which in heavy weather the sea broke, lying with Leong Soi point bearing N.W. ¼ W., distant about 12 miles, lat. 18° 14′ N., long. 110° 12½′ E. (marked P.D., and shoal water reported in this locality). (2.) Approximate position of a shoal, on which the sea broke, lying with Leong Soi point bearing N.W. ¼ W., distant about 6 miles, lat. 18° 18′ N., long. 110° 8′ E. *Variation*, 1° *E.*

Note.—From the above, it is considered that shoal ground with unequal depths may exist for a distance of about 12 miles south-eastward of Leong Soi point. Mariners therefore navigating in the vicinity should use caution.

175.—China.—*East Coast.—Chusan Archipelago. — Light on Loka Island, and Discontinuance of Provisional Light.*—With reference to notice in 1889, on the intended exhibition of a light on Loka island, south eastern part of Chusan archipelago; on or about the 12th January, 1890, the permanent light would be exhibited from a lighthouse erected on the north point of Loka island; and the provisional light discontinued. The permanent light on Loka island is a fixed light, showing *white* from the bearing of N. 15° W. to N. 85° W.; *red* from N. 85° W. to S. 82° W.; *white* from S. 82° W. to S. 24° W.; *red* from S. 24° W., through south, to S. 87° E.; *white* from S. 87° E. to N. 82° E.; and is obscured by Loka island from N. 82° E., through north, to N. 15° W. It is

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elevated 128 feet above the sea, and the *white* light should be visible from a distance of 15 miles. Illuminating apparatus, dioptric, or by lenses, of the fourth order. The lighthouse, 29 feet high, constructed of stone and circular in shape, is painted white, as are also the keepers' dwellings. Position, lat. 29° 58′ 15″ N., long. 122° 27′ 20″ E. *Variation*, 2° *W.*

Note.—This light is exhibited mainly in the interests of Chinese junks and fishing boats. Until further notice is given, the limits of the sectors must be considered subject to alteration, those of the *red* sectors being experimental. Foreign vessels therefore should not use the light with confidence.

176.—CHINA.—*East Coast.—Yang Tse Kiang.—South Channel. —Decreased Depths N.W. of Kiu Toan Light-Vessel.*—In the early part of November, 1889, the pilots stated that the depth of water in the south channel, N.W. of Kiu Toan light-vessel, had decreased considerably, 18 feet having been found with the light-vessel bearing E.S.E., distant about 1½ mile, where 4 fathoms have heretofore been shown on the charts.

Note.—Vessels drawing more than 18 feet should navigate in this locality with caution, especially when near L.W., as it is possible the change taking place may affect a considerable section of the river. *Variation*, 2° *W.*

177.—JAPAN.—*Inland Sea.—Depth on Shoal Eastward of Takami Sima.*—The commander of the steam-vessel *Saikio-maru* has reported having grounded on the shoal lying about 1¼ mile eastward of Takami sima, Inland sea. A depth of 2¼ fathoms at L.W., over mud and sand, was found close to the 4¼ fathoms heretofore shown on the Admiralty Charts, lying with the south extreme of Usi sima, bearing N.E. by E.; the N.W. extreme of Awa sima W. by S. Sly.; and the south extreme of Takami sima W. ¼ S., distant $1\frac{8}{10}$ths mile. Position, lat. 34° 18′ 35″ N., long. 133° 42′ 20″ E. *Variation*, 5° *W.*

178.—JAPAN.—*Isumi Strait.—Tomangai Sima.—Provisional Light Pending Re-Building the Lighthouse.*—It being necessary to alter the position of the lighthouse on the western extreme of Tomangai sima, in order to construct a fort there, the permanent light (fixed white) would be discontinued on 20th February, 1890,

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and a provisional light exhibited, pending re-building the light-house, from a wooden tower erected 34 yards north-westward of the old site. The provisional light on Tomangai sima is a *fixed white* light, visible from the bearing of N. ¼ W., through east, to S.W. by W., elevated 193 feet above the sea, and should be seen from a distance of 15 miles. Position, lat. 34° 17′ N., long. 135° 1′ E. *Variation*, 4° *W.*

179.—JAPAN.—*Yezo Island.—East Coast.—Go Yo Mai Channel. —Sunken Rock in Fairway.*—The commander of the steam-vessel *Mutsu-maru* has reported having touched on a sunken rock, lying in the fairway of Go Yo Mai channel; but that the speed of the vessel prevented its accurate position being determined. The following bearings were taken for the rock in Go Yo Mai channel:—South extreme of Moi Kojima, E. ¾ N.; Cape Noyshaf lighthouse, N.W. by W. ¼ W., distant $1\frac{3}{10}$ths mile. Approximate position, lat. 43° 23′ N., long. 145° 49′ E. (marked P.D.). *Variation*, 5° *W.*

Note.—Mariners navigating this channel should use caution, until further examination of the locality has been made.

180.—NEW GUINEA.—*North Coast.—Shoal Southward of Mofia Island.*—The master of the German steam-vessel *Isabel* has reported the existence of a shoal lying southward of Mofia island. A shoal, extending about 4 miles in an east and west direction, on which the sea breaks, and which is visible by discoloured water, lies 3 miles S. by E. ¼ E. from Mofia island. Approximate position (centre), lat. 0° 31′ S., long. 135° 15′ E. *Variation*, 2° *E.*

181.—NEW GUINEA.—*South Coast.—Reef Reported Southward of Round Head.*—The master of the barquentine *Nellie* has reported that when proceeding from Dinner island to port Moresby in September, 1889, the vessel (drawing 12 feet) touched on a coral reef lying about 12 miles southward of Round head, south coast of New Guinea. The position of the coral reef, lying about 12 miles southward of Round Head, with an estimated depth of 10 feet, is stated to have been fixed by bearings of Round head and Hood point, but they are not furnished; the small scale chart No. 2764 being in use; and the lat. (10° 6′ S.) and long.

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(147° 30½′ E.) alone are given. This position must be regarded as approximate.

182. — AUSTRALIA. — *N.E. Coast. — Inner Route. — Howick Group.—Non-Existence of Harrington Rock.*—Information from Lieutenant and Commander G. C. Frederick, H.M. surveying-vessel *Dart*, relative to a search made in December, 1889, for Harrington rock, reported in 1874 as lying southward of Coquet island, Howick group, and to have less than 6 feet of water on it. The *Dart* was anchored 8 cables south-eastward of the reported position of Harrington rock (lat. 14° 33½′ S., long. 145° 1½′ E.), and the boats sounded closely round for a distance of 7½ cables, without any evidence of shoal water being observed. The soundings show the bottom as evenly sloping from 6½ fathoms near the track recommended on the west to 8 fathoms on the east, and no appearance of shoal or discoloured water was seen from the masthead. Subsequently the *Dart* steamed over the reported position. On two previous occasions, the *Dart* had passed close to the reported position, without any indication of shoal water being seen. Considering that in the original report there was no positive evidence of a rock, and that had one existed, it would probably ere this have been again reported, this examination of the *Dart* is considered to disprove the original report, and Harrington rock has therefore been removed from the Admiralty charts.

183.—NORTH AMERICA.—*West Coast.—Vancouver Island.—West Coast.—Ou Ou Kinsh Inlet.—Rock Awash Reported in Fairway of Approach.*—Reported by late master of the schooner *Juanita*. A rock (stated to be awash at H.W.) in the approach to Ou ou Kinsh inlet from the south-westward, lies with Clara islet bearing N.E., distant 1½ mile, and the outermost (south-western) islet of the Barrier islands E. by S. Position, lat. 50° 3′ 40″ N., long. 127° 39′ 25″ W. *Variation*, 24° *E.*

Note.—The leading mark heretofore given (entrance of Ou ou Kinsh inlet open, bearing N.N.E., Nly., leads 1½ mile eastward of Sulivan reefs) is no longer available.

184.—SOUTH AMERICA.—*Tierra Del Fuego.—Wollaston Islands.—Mission Station on Baily Island.*—The South American Missionary Society, London, states that a mission station, named *Wollaston*,

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was established in October, 1888, at the northern part of Baily Island, Wollaston islands, as a place of refuge for the crews of vessels wrecked or abandoned in the vicinity of cape Horn; and that latest advices state the station to be steadily developing. Approximate position, lat. 55° 37′ S., long. 67° 36′ W.

185.—West Indies.—*Trinidad.—East Coast.—Shoal Eastward of Galera Point.*—Captain Sir Baldwin W. Walker, Bart., H.M.S. *Emerald*, reports that during the forenoon of 10th February, 1890, soundings of 10, 8, and 7 fathoms were obtained in the chains, when about 17 miles E. by S. from Galera point, the N.E. extreme of Trinidad. A shoal (*Emerald shoal*) eastward of Galera point, apparently about half-a-mile in extent, composed of coral (the bottom having been clearly seen), with a least depth found of 7 fathoms, but appeared shoaler, lies with the following bearings: —Eastern extreme of Tobago, N. 10° E.; L'Ebranche hill, Trinidad, S. 57° W.; Southern fall of hill, Salibia point, Trinidad, S. 78° W.; Northern fall of land near Galera point, Trinidad, N. 80° W. Position, lat. 10° 47′ N., long. 60° 36′ W. *Variation, nil.*

186.—United States.—*Delaware.—Delaware Breakwater.—Discontinuance of Fog-Signal at Front Light Station.*—With reference to notice in 1889, that the fog-bell and tower at front light station, Delaware breakwater, had been washed away; by further notice, dated 31st January, 1890, the fog-bell at front light station, Delaware breakwater, has been discontinued. Position of breakwater, lat. 38° 48′ N., long. 75° 6′ W.

187.— United States. — *Massachusetts. — Boston Harbour Entrance.—Main Ship Channel.—Nicks Mate Light-Buoy Withdrawn.*—On or about 25th January, 1890, the light-buoy (gas) off Nicks Mate beacon, Main Ship channel, Boston harbour entrance, would be withdrawn.

188.—Nova Scotia.—*S.E. Coast.—Beaver Island and Egg Island Lights.—Intended Alteration in Character.*—With reference to notice in 1889, that under certain conditions of weather, the light on Beaver island, and that on Egg island, 25 miles southwestward of it, had been mistaken for each other; on 15th June, 1890, in order to obviate the risk of confusion between the two

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above-mentioned lights, and to increase their efficiency, the following alteration will be made in the character of the lights:—

(1.) *Beaver Island Light* will be a *flashing* white light, showing a flash *every forty-five seconds*. In all other respects the light and station will remain as heretofore. Position, lat. 44° 49′ 35″ N., long. 62° 20′ 10″ W.

(2.) *Egg Island Light* will be a *group flashing* white light *every minute*, showing *three flashes*, with intervals of *fifteen seconds* between their points of greatest brilliancy, followed by an interval of *thirty seconds*, during the greater part of which interval the light will bo totally eclipsed. Position, lat. 44° 39′ 55″ N., long. 62° 51′ 30″ W.

189.—Bay of Fundy.—*New Brunswick.—Cumberland Basin Entrance.—Light on Ward Point.*—On the opening of navigation in 1890, a light will be exhibited from a lighthouse erected on a point, named *Ward point* (nearly one mile southward of Peck point), western side of entrance to Cumberland basin. The light on Ward point will be a *fixed white* light, visible from the bearing of E.N.E., through north, to S.W. ¼ W., elevated 72 feet above H.W., and should be seen from a distance of 10 miles. Illuminating apparatus, dioptric, or by lenses, of small size. The lighthouse, 22 feet high, is a square wooden building, painted white. Position, lat. 45° 43′ 45″ N., long. 64° 29′ 40″ W. *Variation*, 23° *W.*

190.—Gulf of St. Lawrence.—*Nova Scotia.—Pictou Harbour. —Additional Leading Lights.*—Two additional leading lights are established on the north side of the entrance to Pictou harbour, which will be exhibited throughout the season of navigation; and during the winter whenever steam-vessels are running into the harbour. The lights (*Frazer farm lights*), recently established at Pictou harbour, are *fixed red* lights, visible through a small arc on each side of their line of direction, from a distance of about 3 miles. The outer (eastern) light, shown from a mast 15 feet high, and elevated 56 feet above H.W., is situated 200 yards from the shore, with the lighthouse (*Pictou bar*) on the south side of the harbour-entrance bearing S.E. by S., distant 5¼ cables. Position, lat. 45° 41′ 50″ N., long. 62° 40′ 15″ W. *Variation*, 24° *W.* The inner light, shown from a mast 30 feet high, and elevated

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75 feet above H.W., bears from the outer light N.W. by W. ½ W., distant 150 yards.

Note.—Vessels entering the harbour, should keep Pictou bar and the Custom-house lights in line bearing W. ½ N., until Frazer farm lights are brought in line bearing N.W. by W. ½ W., which should then be steered for until Pictou bar light is nearly abeam, whence a W. ½ S. course will lead to the anchorage off Pictou.

191.—GULF OF ST. LAWRENCE.—*Prince Edward Island.—Charlottetown Harbour.—Additional Leading Lights.* — On the opening of navigation in 1890, or sooner if required, two additional leading lights will be established on the eastern side of York (North) river, Charlottetown harbour, and will be exhibited throughout the season of navigation, and during the winter whenever steam-vessels are running into the harbour. The lights (*Brighton beach lights*) to be established at Charlottetown harbour will be fixed *red* lights, and will be shown from masts, each surmounted by a diamond as a day mark, with a shed at the foot; the whole painted white. The outer (southern) light will be elevated 40 feet above the ground, and should be visible through a small arc on each side of the line of direction from a distance of 7 miles. It is situated on the N.W. angle of a pier, and bears N. by W. ½ W. from the Hospital on Duchess point, distant 600 yards. Position, lat. 46° 14′ 5″ N., long. 63° 8′ 20″ W. *Variation*, 24° *W.* The inner light will be elevated 72 feet above H.W. (42 feet above the ground), and should be visible through a small arc on each side of the line of direction, for a distance of 9 miles; it bears north from the outer light, distant 425 yards.

Note.—Vessels entering the harbour should keep Hazard point leading lights, fixed *red*, in line bearing N.E., until Brighton beach leading lights are brought in line bearing north, when they should be steered for until abreast Canseau point, whence the course should be altered for the anchorage.

192.—GULF OF ST. LAWRENCE.—*New Brunswick.—Chaleur Bay.—Light on Salmon Point.*—On the opening of navigation in 1890 a light will be exhibited from a lighthouse erected on Salmon (*Belloni*) point, south side of Nipisighit bay, and east side of Bathurst harbour entrance, Chaleur bay. The light on Salmon

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(*Belloni*) point will be a *fixed white* light, visible from the bearing of East, through South, to West, elevated 30 feet above H.W., and should be seen from a distance of 10 miles. Illuminating apparatus will be dioptric, or by lenses, of small size. The lighthouse, 22 feet high, is a square wooden building, painted white. Position, lat. 47° 40′ 20″ N., long. 65° 33′ 20″ W.

WRECKS REPORTED IN POSITIONS DANGEROUS TO SHIPPING.

1.—In Gibraltar Bay: the *Helena* lies in 3½ to 4 fathoms water off Europa point, with the point bearing N.N.E., distant 180 yards; only 2 fathoms on the boiler, and wreckage scattered about.

2.—In North Atlantic: on March 4th, a water-logged vessel in lat. 48° N., long. 22° W.; possibly the *Josephine*, reported in lat. 49° 33′ N., long. 24° 46′ W., on January 31st; current hereabouts sets eastward 14 miles a day.

3.—Japan: at west entrance to Simonoseki strait, between Hiku flat and Manaita rocks, distant 3½ cables off Entrance head; close to track recommended; pass westward of wreck.

HYDROGRAPHIC NOTICES, &C., PUBLISHED BY THE HYDROGRAPHIC OFFICE, ADMIRALTY IN 1890.

No. 1. Notice No. 2, Relating to the Pacific Islands, Vol. II., 1885 (central groups); cancels No. 14 of 1886.

No. 2. Notice No 2, relating to the eighth edition of the South America Pilot, Part II., 1886; cancels No. 9 of 1887.

OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,
1st March, 1890.

THE following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

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NOTE.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
1346	England, W.: Firth of Solway	Extensive corrections. Feb.
2114	Kattegat	Corrections throughout. Jan.
160	Italy, W.: Civita Vecchia to Policastro	Gulfs of Salerno and Policastro. February.
40	India, W.: Karáchi Harbour ...	Corrections throughout Channel. February.
2124	Papua or New Guinea. Sheet 8.	Extensive corrections. Feb.
2431	America, N.W.: Port Simpson to Cross Sound, including Koloschensk Archipelago ...	Prince of Wales Island to Prince Frederick's Sound. February.
2818	North America, E.: Hampton Roads and Elizabeth River...	Correction throughout. Jan.
181	Sicily, E.: Port Augusta ...	New Chart. February.
1235	Persian Gulf, mouth of the Euphrates, Shatt al Arab and Bahmishir River	New Chart. February.
2388	Sea of Okhotsk	Extensive corrections. Feb.
1069	Australia, E.: Port Jackson ...	New Chart. February.
2353	Australia, E.: Sheet XIX., Cape Sidmouth to Cape Grenville	Plan. Night Island anchorage. March.
1079	Tasmania	Tasman Peninsula to S. Cape. Feb.
1385	Tonga or Friendly Islands, plans, Tongata'bu Nuknaloafa Anchorage and Ena Island ...	New Chart. February.
2363	Friendly Islands, Tongata'bu ...	New Chart. March.

Agent for the sale of Admiralty Charts, MR. J. D. POTTER, 31, *Poultry, London, E.C.*

THE Board of Trade have awarded a binocular glass to Mr. Dittmer, master of the steamship *Viola*, of Hamburg, in recognition of his kindness and humanity to the shipwrecked crew and passengers of the s.s. *Penguin*, of London, which was burnt off Ameland on the 13th February, 1890.

THE Board of Trade have awarded a binocular glass to Mr. Matthew J. Bunney, master of the Argentine barque *Ushauaia*, in recognition of his kindness and humanity to the shipwrecked crew of the barque *Cambria*, of Scarborough, whom he rescued at sea on the 20th May, 1890.

THE Board of Trade have received through the Foreign Office a silver commemorative medal, which has been awarded by the

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Italian Government to Mr. Henry Parry, master of the brigantine *Ebenezer Parry*, of Carnarvon, in recognition of his services in receiving on board his vessel and conveying to Monte Video, the shipwrecked crew of the Italian brigantine *Eutella*, which was wrecked in the Atlantic on the 27th May, 1889.

The Board of Trade have awarded their bronze medal for gallantry in saving life at sea, to William Elibank Murray and Quintin A. Rhodes, apprentices on board the ship *Northbrook*, of London, in recognition of their gallantry in going aloft in a hurricane, off Cape Horn, on the 3rd March, 1885, to clear away the wreckage of the main and mizen masts, which endangered the safety of the vessel, and the lives of her crew.

The Board of Trade have awarded their silver medal for gallantry in saving life at sea to Joseph Watson, master of the steam trawler *Heron*, of Liverpool; and their bronze medal for gallantry, and sums of money to James Kilby, second hand, and William G. Payne, deck hand of that vessel, in recognition of their services in rescuing, under circumstances of much risk and difficulty, the shipwrecked crew of the barque *Latona*, of Liverpool, which was wrecked off the Tuskar on the 18th January last.

The Board of Trade have awarded a piece of plate to Mr. George L. Howland, master of the barque *Canton*, of New Bedford, U.S.A., in recognition of his kindness and humanity to a portion of the shipwrecked crew of the barque *British Monarch*, of Liverpool, whom he picked up at sea on the 1st December, 1889, and conveyed to Cape Town.

Official Inquiries at Home, 1890.

8991. *Penthesilia*, ship; built at Pallion, 1869; owned by Mr. E. L. Jones and others; tonnage, 1667; Newport to Mauritius; coal; stranded in Bideford Bay, Bristol Channel, January 19, 1890. Inquiry held at Liverpool, February 10, 1890. before Raffles, Judges; Parfitt and Wilson, N.A. Stranding

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due to master allowing for deviation in the wrong direction, and making no allowance for S.W. tide. Certificate suspended for six months.

3992. *Winsloe*, s.s.; built at Seacombe, 1870; owned by London and Rotterdam Steamship Company, Limited; tonnage, 574; Rotterdam to London; general and cattle; stranded on Hinder Bank, Holland, December 25, 1889, the second mate having previously been lost overboard. Inquiry held at Westminster, February 14, 1890, before Marsham, Judge; Ronaldson, Dyer, and Hallett, N.A. Stranding owing to fires having been put out by water which leaked from main ballast tank doors, and to stress of weather.

3993. *Thorne*, barque; built at Sunderland, 1878; owned by Mr. J. Hargrove and others; tonnage, 876; Liverpool to Adelaide; general; stranded in Douglas Bay, Isle of Man, January 25, 1890. Inquiry held at Liverpool, February 12, 1890, before Raffles, Judge; Parfitt and Wilson, N.A. Casualty owing to violence of wind and sea driving ship from her anchorage.

3995. *Yoxford*, s.s.; built at Willington Quay, 1880; owned by Mr. C. S. Hunting and others; tonnage, 1,209; Revel to Rotterdam; grain; stranded off New Waterway, Holland, November 28, 1889. Inquiry held at Newcastle, February 13, 1890, before Bell and Hamond, Justices; Castle and Bain, N.A. Stranding caused by vessel having been rendered unmanageable through cargo shifting, and rudder carrying away. Master blamed for not providing proper feeding arrangements for grain in lower hold.

4002. *Mary*, schooner, and *Manhattan*, s.s.; former built at Truro, 1855; owned by Mr. J. Hitchins; tonnage, 91; Pentuan to Antwerp; China Clay; latter built at Port Glasgow, 1889; owned by Manhattan Steamship Company; tonnage, 2,153; London to New York; ballast; in collision during a fog in English Channel, January 12, 1890, when former sank and three lives were lost. Inquiry held at Cork, February 24, 1890, before Gardiner, Judge; French, Kiddle and Bragg, N.A. Collision ving to third officer of *Manhattan* failing to comply with ·ts. 13, 17 and 18 of Regulations. Certificate suspended for

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three months. Master censured for not prolonging search for survivors beyond half-an-hour.

4003. *Irex*, ship; built at Port Glasgow, 1889; owned by Messrs. Clink and Wallace; tonnage, 2,248; Glasgow to Rio de Janeiro; iron pipes; stranded in Scratchels Bay, Isle of Wight, January 25, 1890, and master and six others lost their lives. Inquiry held at Greenock, February 26, 1890, before Begg, Judge; Hore and Bain, N.A. Stranding caused by master, when running back, steering for the Needles Light in the belief that it was a pilot boat.

4004. *Provincia*, s.s.; built at Sunderland, 1877; owned by Mr. W. R. Raeburn and others; tonnage, 1,095; Glasgow to Cuba; coal; carried away steering gear in lat. 49° N., long. 12° W., and lost master, mate and a seaman overboard, January 4, 1890. Inquiry held at Glasgow, February 22, 1890, before Spens, Judge; Knox and Cosens, N.A. Loss of life caused by heavy seas washing over the disabled vessel. She was laden deeper than allowed by Tables of Load-Line Committee, but there was no legal proof of overloading.

4005. *Preston*, barque; built at South Hylton, 1865; owned by Mr. W. Davison and her master; tonnage, 336; London to Blyth; ballast; stranded on Hasboro' Sand, February 2, 1890. Inquiry held at Lowestoft, February 21, 1890, before Harvey and Fowler, Justices; Anderson and Cuninghame, N.A. Stranding caused by master neglecting to verify his position although he had ample facilities for doing so. Censured, and ordered to pay £20 towards cost.

4007. *Sarah Mills*, jury-rigged lighter; built as a brig at Walker, 1838; owned by Mr. J. B. Bushell; tonnage, 154; towing from Bo'ness to Aberdeen; coal; stranded at entrance to Montrose River, January 25, 1890, when her crew of four were drowned. Inquiry held at Aberdeen, March 4, 1890, before Wilson, Judge; Ward and Bain, N.A. Stranding owing to vessel being in such an unseaworthy condition that the water was gaining upon the pumps, and it was necessary to run for refuge; and to vessel getting separated from the tug. Owner ordered to pay £100 towards costs.

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4008. *Moscow*, s.s.; built at Sunderland, 1881; owned by Mr. W. Thompson and others; tonnage, 1,089; Savona to Aguilas; ballast; stranded near Cape San Martin, Javea Bay, Spain, January 16, 1890. Inquiry held at Edinburgh, March 7, 1890, before Rutherfurd, Judge; Davies and Brooks, N.A. Stranding due to the lax way in which the courses were given and steered by the pole compass. Master censured.

INQUIRIES BY INSPECTORS, 1890.

35. *Fergusons*, s.s.; built at Sunderland, 1880; owned by Mr. H. F. Craggs and others; cabin damaged by fire at sea, November 6, 1889, and vessel destroyed by fire at Rouen when discharging her cargo of crude petroleum, December 19, 1889. Inquiry held by Mansel Jones, Inspector, February 17, 1890. First casualty due to the upsetting of a paraffin lamp in heavy weather. Final loss owing to the explosive atmosphere in the hold having been ignited by a spark emitted at the makeshift connections of the portable electric lamps with the main cables, the switches originally supplied having broken down.

36. *Arethusa*, barque; built at Greenock, 1869; owned by Mr. W. Hamilton and others; tonnage, 1,271; Tyne to Valparaiso; coal; abandoned on fire 120 miles from Falkland Islands, October 2, 1889, and 5 lives were lost. Inquiry held at Newcastle, February 28, 1890, before Castle, Inspector. Loss owing to spontaneous combustion of cargo of coal, which probably originated in the coal shipped first from barges for stiffening purposes, and which was much broken and wet.

37. *Wildflower*, s.s.; built at Sunderland, 1889; owned by Mr. J. S. Barwick and others; tonnage, 1,745; damaged by fire in the Wear, January 8, 1890. Inquiry held by Mansel Jones, Inspector, March 7, 1890. Casualty owing to the petroleum tanks of the vessel having been drained into the river, where the oil was possibly ignited by a red-hot rivet or piece of burning waste having been thrown into it.

OFFICIAL INQUIRIES ABROAD, 1889-90.

3994. *Alice May*, schooner; abandoned in lat. 29° 50′ N., long. 58° 37′ W., January 8, 1890. Inquiry held at New Orleans,

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January 22, 1890. Abandonment owing to vessel having been dismasted in a violent squall.

3996. *Dalswinton*, ship; burnt at Galle, December 28, 1889. Inquiry held at Galle, January 7, 1890. Fire caused by spontaneous combustion of cargo of jute.

3997. *Berbice*, sloop; capsized off Demerara, November 29, 1889, when two lives were lost. Inquiry held in British Guiana, January, 1890. Casualty owing to sail not having been shortened when a squall was seen approaching.

3998. *Bunyip*, s.s.; struck some submerged substance, 3 miles E.S.E. of Old Bar, Manning River, was beached, and became a wreck, November 18, 1889. Inquiry held at Sydney, December 2, 1889. Master not in default.

3999. *Ariel*, brigantine; dismasted December 10, 1889. Inquiry held at Brisbane, January 10, 1890. Casualty owing to defective rigging.

4000. *Maud Scammell*, barque; stranded at St. Isabel, Brazil, January 2, 1890. Inquiry held at Pernambuco, January 17, 1890. No ground for blaming master.

4001. *Ailsa Craig*, s.s.; stranded on Isola Point, Malta, February 14, 1890. Inquiry held at Malta, February 15, 1890. Casualty owing to the breaking of steering chain.

4006. *Strathblane*, s.s.; struck a rock, and was beached at Chelsea Point, District of Port Elizabeth, January 23, 1890. Inquiry held at Port Elizabeth, January 30, 1890. Stranding due to master navigating too close to shore, and being misled by erroneous directions respecting the shutting in of Cape Receiffe Light, which was visible even after vessel was beached.

4009. *Adonis*, brigantine; abandoned off Crowdy Head, December 21, 1889. Inquiry held at Sydney, January 6, 1890. Loss owing to vessel springing a leak.

4010. *Spaniel*, s.s.; stranded on Laut Reef, South Natuna Islands, December 21, 1889. Inquiry held at Singapore, January 13, 1890. Stranding owing to current, and to master mistaking the islands at night. Censured for not waiting for daylight.

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NAUTICAL GOSSIP AT HOME AND ABROAD.

The Bill promoted by Mr. Plimsoll for making an authoritative marking of load lines on all British ships compulsory has been read a first time. It has been stated in the daily papers that the Government will support the Bill, and that it will be amended so as to provide for the marking of the freeboard in accordance with the Load-Line Committee's table, by either the Board of Trade or Lloyd's Register Society at the option of the owner; also that its provisions will be extended so as to include foreign ships loading in British ports.

In the number of the *Nautical* for August, 1889, was given the report of the committee appointed under the Merchant Shipping (Life-Saving Appliances) Act of 1888, together with the rules as to boats and other life-saving appliances to be carried in future by the various classes of ships. A clause in those rules provided for certain partial exemptions with regard to the number of boats to be carried by vessels, "divided into efficient water-tight compartments, so that, with any two of them in free communication with the sea, the ship will remain afloat in moderate weather." In a postscript to their report the committee further said:—"We have shown some appreciation of the importance of efficient sub-division of ships in these rules, but we consider it our duty to further express our sense of the importance of the question, and to recommend that it should be investigated by a committee of duly qualified persons, the subject as a whole having been held to be outside the scope of the reference to this committee.

It is now reported that the President of the Board of Trade has appointed a committee to consider how best to secure the safety of ships at sea in case of collision, and to report specially with reference to the extended use of bulkheads in the construction of ships. The committee consists of Sir Edward Harland (of Belfast), M.P., Mr. T. B. Royden (of Liverpool), M.P., Mr. A. C. Kirk (of Glasgow), Professor P. Jenkins (Glasgow University), Mr. J. G. S. Anderson, and Mr. J. Laing (of Sunderland).

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It is stated that negotiations are now in progress with the French Government, and it is hoped the Newfoundland lobster fishery question will soon be brought to a satisfactory ermination. Meanwhile the vessels of each nation are to act as during the last season, and the cruisers have been instructed accordingly.

Baron Nordenskjöld, the successful navigator of the North-East Passage, is, it is said, making arrangements with a view to Antarctic exploration. The Australian Colonies are willing to contribute £5,000, and Mr. Oscar Dickson, of Goteborg, the Baron's former patron in exploring work, has promised a like sum, but considerably more than this will be necessary. Baron Nordenskjöld hopes to leave for the new expedition in the autumn of 1891.

In speaking of the subject recently before the Swedish Academy of Science, the Baron referred to former expeditions, and to the fact that previous to the time of Captain Cook a "great Antarctic Continent," stretching far northwards into the Pacific, was believed in. Captain Cook extinguished that delusion. Antarctic expeditions were undertaken by Bellingshausen in 1819-21, Weddell and Biscoe 1822-34, Wilkes 1840, and Ross in 1841-43. The last was the most successful, the furthest point south being reached, and Victorialand, with its impassable ice-wall and two high volcanoes, the *Erebus* and *Terror* discovered. All these expeditions were by sailing ships, and nothing has been done since.

At the annual meeting of the Yacht Racing Association on 3rd March, a new rule was adopted with a view to making the Association representative of all the yacht clubs in the country. In future every royal or recognised yacht club in the United Kingdom shall have the power to appoint representative members of the Association. If the number of members of the club is under three hundred, it may appoint one representative; if over three hundred, two, on condition of paying a subscription of two guineas for each representative. A few minor alterations are made in the

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sailing rules, the most important being that every yacht of more than 40 rating shall in future carry a boat on her deck.

THE magnitude of American inland navigation may be inferred from the fact that last year on the lakes alone 94,000 tons of new vessels were set afloat. Of this tonnage, 98 vessels were steamers of an aggregate tonnage of 80,000, and 23 schooners and barges, aggregating 14,000 tons. One steamer measured 2,670 tons.

IT is proposed to build a dam or embankment in the Y before Amsterdam so as to form a means of communication with the other side, instead of the bridge. This embankment would have openings, with drawbridges, to let ocean steamers and other passing vessels through, and the cost is estimated at £200,000.

THE Norwegian Government is considering the propriety of providing salvage steamers on the coast of Norway. The Hangesund Nautical Society recommends the building of three steamers of this type, at a cost of about £10,000 each, to be stationed respectively at Christiansund, Egersund, and in the vicinity of Bergen. Another recommendation is that ten life-boats be constructed, at a cost of £275 each, principally for the protection of the fishermen.

BRITISH trade with Norway is progressing in a most favourable manner. In 1887 it occupied the first place both in imports and exports, and in the succeeding year this position was more than maintained, although the total value of the foreign trade of Norway increased from £13,351,000 in 1887 to £15,600,000 in 1888. For statistical purposes in Norway, Sweden is considered a foreign country. Great Britain took 32·5 per cent. of the total exports of Norway in 1888, Sweden 13·9 per cent., Germany 13·3, Spain 8·6, and France 7·3 per cent. Of the total imports, Great Britain sent 27·9 per cent., Germany 26·9, Russia 13, and Sweden 12·3 per cent. The exports are mainly timber and fish, and it is interesting to note the extraordinary increase of the trade in wood, pulp, and cellulose, which in 1875 amounted to 8,540 tons, valued at £38,000, and in 1888 was 162,455 tons, valued at £510,000.

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The chief imports are grain and flour, manufactured and colonial goods, in the last of which especially there was a very considerable increase in 1888.

THE largest wooden ship ever built in the United States is said to be the *Rappahannock*, which is now on her first voyage, having sailed from Philadelphia to Japan with 1,200,000 gallons of oil in cases for Japan. The vessel has been built at Bath, Maine, at a cost of 125,000 dollars, and is 287 ft. in length, 48 ft. 9 ins., beam, draft of water loaded 28 ft., net register tonnage, 5,053 tons.

THE Mersey Dock Board is arranging to cut a deep channel through the Mersey bar, and Messrs. William Simons & Co., Renfrew, have secured a contract for the supply of a set of powerful sand pumping apparatus, to be fitted to one of the steam hopper barges which was built for the Board some time ago by the same firm.

PALMER'S Shipbuilding and Iron Company, Limited, Jarrow, have decided to add to their already most extensive works a department for the manufacture of ordnance and its accessories, including gun carriages. Colonel English, R.E., hitherto engaged at the Woolwich Arsenal, is to superintend and direct the department, which, when in full operation, is expected to constitute one of the most important and interesting features of the company's works. It is anticipated employment will be afforded for 1,500 men, while already at Howden and Jarrow 7,000 men are employed by Palmer's Shipbuilding and Iron Company, Limited.

VERY few shipbuilding contracts have been booked since the turn of the year, and in nearly every instance the vessels are for special requirements. On the Wear during three months only a solitary order appears to have been received—viz., for a steamer for John Knott & Co.'s "Prince Line," to be built by Messrs. Short Bros., Pallion, and to be engined by Geo. Clark (Limited), of Southwick Engine Works, with "quadruple" expansion engines,

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the boilers fitted with Purves's ribbed flues having a working pressure of 200 lbs. per sq. in.

On the Clyde, four electric launches for service on the River Seine, and two steamers to carry fruit between America and the West Indies, are the only orders recently received. On the Tyne, Messrs. C. S. Swan & Hunter, Wallsend, have secured an order for three vessels for a foreign company; and Messrs. R. Stephenson and Co., Hebburn, have booked a contract for the Wilson Line, of Hull. All the orders received do not suffice to make up the gaps occasioned by the completion of vessels.

Under the foregoing circumstances, it is certainly foolhardy on the part of the engineering employés of the Tyne and the Wear to go out on strike—but this is what has happened. There is at the time of writing, every appearance of a long strike, and seeing how prolonged was the Sunderland strike in the same branch of trade a few years ago—and how in the end the workmen did not win, their present conduct is all the more inexplicable, and they were met by the employers in a very fair spirit.

An invention for the prevention of fire in cotton cargoes is, says *Industries*, attracting some attention. Jute packing is objectionable on two grounds. It is woven loose, and therefore does not completely cover the cotton bale—and being of an inflammable nature, is rendered easily combustible on account of oil being used in its preparation. The improved packing is the invention of Mr. Samuel Quilliam, of Liverpool, and is said to be a non-inflammable close woven bagging, the cost of manufacture being very little in excess of bagging now used.

TRITON.

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THE

NAUTICAL MAGAZINE.

FIFTY-NINTH YEAR.

VOLUME LIX.—No. V.

MAY, 1890.

THE INSTITUTION OF NAVAL ARCHITECTS.

THE meetings of the Institution were held this year on the 26th March and following days. From the annual report it would appear that the society is still in a very flourishing condition financially, and the papers read, although less in number than is usually the case, were many of them of considerable interest and importance. In his annual address the President, the Earl of Ravensworth, alluded to shipbuilding statistics for the past year. While the output of tonnage for 1889, amounting to 1,286,000 tons of shipping, of the value of £20,000,000, had exceeded that even of the remarkable year 1883 by a considerable amount, the complete replacement of iron by steel as the material for shipbuilding was shown by the fact that whereas in 1883 85 per cent. of ships built had been of iron against 15 of steel, in 1889 only 8 per cent. were iron against 92 per cent. of steel. A further noticeable fact was that last year the bulk of steam tonnage built had been for regular lines or special trade, and from this it might be inferred that the building had not been of an inferior and speculative class, but for superior vessels. Orders were, it is true, scarce now, as in consequence of the rise in the price of materials the price of ships had gone up 25 per

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cent., but there was still a considerable demand for ships from foreign sources, many British ships being sold for abroad. At the beginning of the year there were 830,000 tons of shipping on hand, besides large Government orders. Lord Ravensworth next alluded to the disturbing effects of strikes, mentioning one recent case where the order for a large war-vessel for a foreign power was placed on the Continent, because, although the price of the English firm was lower, they did not feel safe in waiving a strike clause in their contract to which exception was taken by the foreign Government. On the question of the Load-Line Bill now before Parliament, the President expressed himself at some length, and in adverse terms, believing that its effect, if passed, will be to lead to a large transfer of British shipping to foreign flags. At the annual dinner of the Institution, which was held in the evening of the same day, the First Lord of the Admiralty, who made the chief speech of the evening, occupied himself principally with a defence of the 110-ton gun, and with other questions of naval ordnance.

Coming now to the papers read at the meetings, we begin with one which, with the discussion upon it, occupied the whole of the meeting on the 28th. It was read by Mr. W. H. White, Director of Naval Construction, and was entitled :

"Notes on Recent Naval Manœuvres."

Mr. White began by stating that the paper was the outcome of the manœuvres of last year, during which he was on board one of the ships, and had opportunities of witnessing their behaviour under unusually bad conditions of weather for the time of the year. First dealing with the question of the influence of size and weight upon the sea-going qualities of war-ships, he remarked upon the fact that in the vessels present they had every class from torpedo-boats of less than 100 tons to the *Inflexible* of 12,000 tons. While recognising the comparatively limited scope of the observations possible during the manœuvres, it is undoubted that everyone who saw the ships under circumstances of bad weather must have been impressed with the superior behaviour and fighting qualities possessed by the larger vessels as compared with the smaller, when other features—such as freeboard and height of guns above

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water—were similar in ships of different sizes. There is a general agreement that, up to certain limits, increase of size results in considerable advantages. But it has been said that beyond a certain limit, and that a not very considerable one, further increase of size was but a small advantage. Sir Nathaniel Barnaby, for instance, last year advocated the construction of fighting vessels of 3,000 to 3,500 tons displacement, giving, as his opinion, that any weather which would sensibly affect the comparative behaviour of the ship of 3,200 tons and that of 14,000 tons would be found to be not fighting weather for either ship. Mr. White's experiences of last year led him to believe, on the contrary, that *fighting weather* at sea is not a fixed or determined quality for ships of 3,000 tons and upwards, but that the possibility of any ship continuing to fight and maintaining speed depends largely upon her length and size, as well as upon her freeboard and the disposition of her armament. Vessels of 3,000 tons, such as the *Medea* class, are good sea boats, and it would be very bad weather that placed them entirely *hors de combat*, but it was obvious when they were seen in rough weather alongside a belted cruiser of 5,600 tons or the *Warspite* of 8,400 tons, that these latter had very superior powers of maintaining speed and fighting because of their greater size and weight, and, no doubt, one of the new battle-ships of 14,000 tons would have shown to still greater advantage. *Fighting weather*, however, is a very elastic term, and modern appliances have done much to extend its meaning. As an example of this it may be stated that, during the recent manœuvres, in the *Howe* when placed intentionally beam-on to a heavy sea, and with the ship rolling through arcs of 35 to 40 degrees every 5¼ seconds, the after turntable carrying two 67-ton barbette guns was cast loose, and the guns successfully worked. Even under these conditions the ship could have been fought, but the same could not be said of a smaller vessel.

Mr. White next remarked upon the great influence of length upon the maintenance of speed at sea. It may be noted that the question is not the effect of length and fine lines upon the speed of the ship in still water, but the value of length in enabling her to keep up speed in rough water. Figures given show an increase

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of length in recent designs for H.M. ships, and the fact is adverted to that in fast ships in the Mercantile Marine still greater relative length and narrowness are common. It is, however, not ratio of length to beam but absolute length which is of importance for maintenance of speed at sea. First-class passenger steamers of the first rank greatly exceed, in displacement as well as length, even the largest cruisers yet constructed (H.M.S. *Blake* and *Blenheim*). On this account it is unreasonable to expect that any regularly built war-cruisers yet contemplated can catch vessels like the *City of Paris* or *Teutonic* or *Umbria* at sea. It has been proposed that war-cruisers should be built equalling these "greyhounds" in speed and coal endurance, but surpassing them in armament and protection. To do this must involve still greater displacement and cost; and one may well hesitate in embarking on such a course, so long as we possess not merely a vast superiority in swift merchant steamers available as auxiliaries to the regular fleet, but also larger war-cruisers than are to be found in foreign navies.

Dealing next with the question of the freeboard of war-ships as affecting the fighting efficiency at sea, the experience of the manœuvres shows that low freeboard forward, such as obtains in some of H.M. ships, puts a practical limit upon the power of driving ships against a head sea, and entails increased power to maintain a given speed in a moderate sea. Low freeboard aft is less important, but is disadvantageous as regards habitability or comfort, and of low freeboard throughout the length the same may be said with the addition that it reduces sea-keeping qualities. High ends with a moderate clear side amidships, while admitting of a smaller and cheaper ship fulfilling fixed conditions of speed, armament, &c., entails sacrifices in the way of "wetness" and discomfort when hard driven. As the result of these experiences the Admiralty have decided to construct a considerable number of the projected second-class cruisers with flush upper decks, thus entailing increased size and cost, but adding to their sea-going and fighting qualities. In connection with the question of habitability, Mr. White emphatically denies the truth of statements which have appeared in the public press as to the bad arrangement and

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ventilation, &c., of the quarters for the officers and crews in H.M. ships, and in this matter went into considerable detailed refutation.

In dealing with the thorny question of sea speeds and measured mile speeds of war-ships Mr. White began by reminding his audience that they are designedly and avowedly made under the best possible conditions—engines and boilers in perfect order, the best coal, skilled stokers, calm weather, smooth water, and clean, freshly painted bottoms. Only under these conditions can such trials be of service either for purposes of comparing ship with ship, or of yielding information of value for future designs. The same is done in the case of war-ships by all nations. Of late years regulations made from time to time have increased the stringency of the conditions of speed trials, so that the old practice of simply running the mile is a thing of the past, and the so-called measured mile speeds of H.M. ships are the result of three to four hours' steaming on forced draught while the natural draught speed is the result of eight to twelve hours' continuous steaming. While the speeds given in the Navy List are the forced draught trial speeds, official records in the Navy Estimates and elsewhere give both the natural and forced draught speeds. Passing from these standard trial conditions to the conditions of actual service, everyone having any acquaintance with the subject is well aware that there must be considerable falling off in speeds. Engines and boilers will not remain in perfect order; coal is often of indifferent quality; stokers are not always efficient, the ship's bottom becomes fouled, and, further, there is often rough weather at sea in contrast to the uniformly calm weather of the trial. For years past the Admiralty practice has been to assume that the maximum power likely to be developed continuously for steaming at sea over long periods will be not more than *two-thirds*, or less than *one-half*, of the natural draught-power developed on the contractor's trial, and this is on the assumption of clean bottoms and smooth water. The reduced speeds under this rule are stated in this year's Navy Estimates for all the ships now building.

Mr. White then went on to explain the course adopted in the trials of the *Medusa* and sister ships, which have been the subject

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of much unfavourable criticism as regards their speed trials. He claims that they did all that was promised for them, and applying the rule stated above their speed is 19·9 knots with forced draught, 18 knots natural draught on trial, but for continuous steaming at sea the speed is put down at 15¾ knots.

Regarding the next branch of the subject, THE SPECIAL CHARACTERISTICS OF WAR-SHIP PROPULSION, it is necessary to consider the essential differences between the services which have to be performed by war and by merchant vessels. A passenger-ship is built and engined for the purpose of steaming cautiously at certain maximum speeds, she works under fairly uniform conditions of development of power and revolutions of engines, and everything is regulated to give the best results under these conditions, and everyone on board is accustomed to fairly regular performances. This fact greatly favours economy and efficiency, and the regular return to port enables constant attention to be given to desirable repairs or adjustments. A war-ship even when proceeding alone is not so circumstanced. Most of her cruising is done at low speeds, requiring only a small proportion of the power she possesses in order that on occasion she may rush up to a high speed. The waste work inevitable under circumstances of this kind must be considerable at low cruising speeds. To meet this point in the *Blake* and *Blenheim*, with engines of over 13,000 H.P. natural draught, two sets of engines to each of the two propellers have been adopted, with special disconnecting arrangements to permit of throwing out the forward sets when cruising at low speeds. When a war-ship forms one of a fleet, the case is still more difficult. In fact, if the fleet be required to manœuvre at any given speed, every commanding officer would be compelled to have command of steam equivalent to a possible margin of speed of two or three knots in order to ensure keeping station. All this appears mere matter of course, but still it furnishes some explanation of questions concerning the consumption of coal and wear and tear of machinery in war-ships as compared with merchant ships.

In conclusion, Mr. White states some alterations and additions which have been found necessary in certain classes of ships as a consequence of the experience gained in the manœuvres. Additional

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ventilation has been found desirable in many cases, especially to engine and boiler-rooms placed under protective decks. Greater facilities for intercommunication between engine-rooms and boilers at a low level in the ships have been found absolutely necessary for safety and good working. This involves forming doors in bulkheads, but with the perfect drill in closing water-tight doors now established in the Navy, the interference with unbroken water-tight sub-division can be accepted. Improved arrangements for the transport of coal from the upper bunkers to the fires in ships with protective decks have been found desirable, and are being adopted.

The discussion upon Mr. White's paper turned very much in the direction of a discussion of the question of forced draught. Admiral Mayne, who opened, alluded to captains of men-of-war during the manœuvres being afraid to use forced draught, upon which Mr. White stated that the use of forced draught was, in fact, prohibited during the manœuvres. Thereupon the Admiral stated that, in his opinion, captains would be afraid to use it whether it was allowed or not. His view was that forced draught was undesirable under any circumstances, for even in case of war, when additional speed was of the highest importance, there would be more likelihood of loss from breakdown of the engines than of gain from additional speed that might be obtained. This view of the case was taken by other naval officers who took part in the discussion, but some expressed the opinion that if any means of increasing speed were at hand the captain of a ship in action would run the risk, would, in fact, run any risk, rather than be worsted in a fight. It appears to us that if forced draught on the Admiralty system is to be relied on in action, officers must be allowed to try it occasionally in time of peace. If, as is stated so often, a run under forced draught involves so much in the way of leaky tubes and damage to the boiler that it cannot be permitted to be used except on an emergency, it is very questionable if the ship would not be better without it altogether. It may be, however, that the system is, as Mr. White said in reply, suffering from merely infantile complaints, and that these may in time be remedied. At any rate it would appear that if forced draught is to be relied on

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in actual war, officers should be allowed to try it during naval manœuvres.

The meeting on the 27th opened with a paper by Rear-Admiral P. H. Colomb, R.N., entitled:

"The Washington Maritime Conference."

This paper was chiefly occupied with the question of the rule of the road at sea, which indeed was the chief matter of deliberation at the Conference. Premising that the Conference had in considering the question to start with the law as it is at present, and with technical terms contained therein which have never been satisfactorily defined, and considering also the way the Conference was constituted, Admiral Colomb is of opinion that the result was on the whole satisfactory. It could not be expected that a large and diverse assembly should take the step of discarding all that was non-essential, and of bringing out in firm, terse language what was wanted and no more. Such things never come from large and diverse assemblies, but may be expected only at the hands of a very small number of minds highly trained to treat the subject, not tied to time and disposed to go to the bottom of the whole question. The writer then proceeded to criticise the "indefinable terms" of the present law; such as "risk of collision," "keep out of the way of," "wind aft," "meeting nearly end on," "crossing," "overtaking;" quoting in illustration of his points legal opinions from Marsden and other authorities. Much of the criticism was based upon the difficulty of saying with exactness the precise limits of terms such as "crossing," &c., that is to say, where does "crossing" end and "nearly end on" begin. It appears to us that the value of distinctive terms of this kind depends upon the possibility of making the distinction in practice which every shipmaster can do, not upon giving mathematically exact definitions of them which no one is required to do.

Coming now to Admiral Colomb's own views as to the way in which the law requires alteration, he first enquires, "What is the law wanted for? What is required for the mutual safety of two ships? and when are two ships safe without it?" This question he answers by saying that a law is never required unless the two

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ships are steering for the same point. "If they are not steering for the same point, law is not required, because both ships are already in perfect safety. . . . . The law up till 1840 provided that one of the two ships designated by facts which were known to, or presumably known to both, should be given the right to go on steering for the point, and that the other ship was forbidden absolutely to steer for that point or for any other point in the path which the first ship was pursuing."

Reference was then made to diagrams showing the crossing angle of the courses of ships in collision, cases which had been before the Admiralty Court, in order to bring out the fact that "the mean conditions under which collisions now occur and against which the law ought to provide, is a crossing angle of about three points of the compass. . . . . Say four points, and then we have the crossing angle for ships close-hauled on opposite tacks on the conditions shown in Fig. 1."

Admiral Colomb then deals at length with this case, and in order that his views on this most important part of the subject may be fairly placed before our readers, we give them verbatim as follows:—

"It is convenient to take this common case, because it is just the same case now as it was two hundred years ago, and the only thing that has differed is the law for preventing the ships from coming into collision. Taking this law as it was when it disappeared from the Royal Naval Signal Books as late as 1868, we have it thus:—'When any ships under sail on different tacks, by continuing their course must pass near each other, the ship on the starboard-tack (that is the ship Y in Fig. 1) is invariably to keep to the wind, and the ship on the port-tack (that is the ship X) is *upon all occasions* to give way and pass to leeward, taking care to bear up in sufficient time for that purpose.'

"The glosses put on this rule by the Law Courts always tended to strengthen it as regarded X; one of the glosses much quoted being 'the ship on the port-tack *must never put her helm a-lee.*'

"Putting this into rules governed by the coloured lights now displayed, and using their language, we should have it that the ship X 'is *upon all occasions* to port her helm and show her red

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FIG. 1.

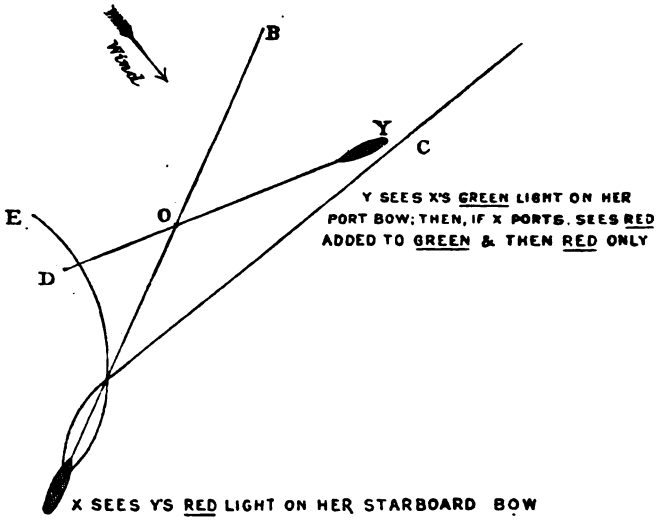
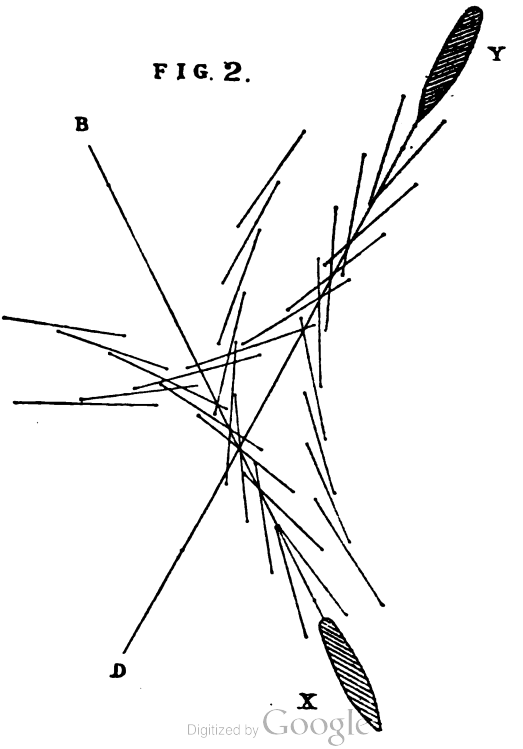

Wind
B
Y
C
E
O
D
Y SEES X'S GREEN LIGHT ON HER PORT BOW; THEN, IF X PORTS. SEES RED ADDED TO GREEN & THEN RED ONLY
X SEES YS RED LIGHT ON HER STARBOARD BOW

FIG. 2.



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light to Y.' And the gloss would be that ship '*must never approach Y showing her green light.*'

"It is plain that there is nothing ambiguous, or wanting explanation, in this old rule. Even the term 'close-hauled' is omitted as likely to be indefinite, and all that is aimed at is the certainty, as far as obtainable by regulation, that X shall cease as soon as possible to steer for the point O, and shall steer for some point, making it certain that she shall pass astern and not ahead of Y,—or along the line X C.

"But the law which came before the Conference was a very different one. It ran thus in Article 14 (3) :—

"'A ship which is close-hauled on the port-tack shall keep out of the way of a ship which is close-hauled on the starboard-tack;' and (Article 22) 'the other shall keep her course.'

"Why was the change of language made? Its effect was to take off the pressure of the law on X without taking it off Y. Y was still compelled to keep her course, but liberty was given to X to do what until 1863 it was said *she must never do*, that is, to put her helm a-starboard and turn along the path X E.

"There is no doubt about this. Marsden says: 'A ship required by the regulations to keep out of the way of another may do so in any way she thinks proper. She may go ahead or astern of the other, and she may put her helm to port or starboard, as she thinks best. But she has no right to embarrass the other, or to put her into a difficulty.'

"As the Court of Appeal put it in the celebrated case of the *Memnon* steamer, 'The Act of Parliament says you shall not be liable for trying to go ahead if you escape, but if you do not, your conduct is worse than if you tried to go astern.'

"So anxious were the framers of rules before 1840 to keep to the principle already laid down, that it was held in the Courts that if X were certainly close-hauled, and Y 'quite free,' yet still X was to bear up and pass to leeward.

"It is plain to be seen that this modern principle of Y being bound to keep her course, and X not being bound at all, runs through all the rules, in direct and deliberate opposition to the principle which governed all international rules for sailing-vessels until 1863.

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"It is strange that such a revolution should, to this day, be without any apology. No one has attempted to say why, if it was right for a hundred years, to declare that X *must never* put her helm a-starboard, it should have been held, in 1863, wrong to declare it.

"We can see, and the Conference seems to have seen, clearly enough, where the mistake lay. The framers of the rules must, if they thought the matter out at all, have had in their minds the idea of X being much closer to O than Y was; or of both ships being so close together that circumstances of some kind not thought out, might make it much safer for X to starboard her helm towards E than to port it towards C.

"If this was the case it was forgotten that if the ships were well apart in time, and yet X was much nearer O than Y, no law was required, and X need make no movement. Or that, if the ships were very close together in time or distance, we got the case shown in Fig. 2.

"I need not go further into that figure than to remark that it is drawn from the measured movements of actual ships when turning; and to show that nothing that X can do will avoid a collision if Y keeps her course; that one helm is as safe as the other for X, but that a collision is certain if Y does not put her helm a-starboard.

"As to this starboard helm for Y, it is to be noted that the more recent changes in the law, and the more recent judgments of the Courts thereon, show that there is more pressure on Y not to alter her course than there used to be.

"Now I must observe, what is very little understood, that if we constructed a series of diagrams, keeping in all case the stem of X at the same distance from the stem of Y that it is in Fig. 2, and supposing X to be steering North, we allowed Y to be steering South, S. by W., S.S.W., and so on, until we had her as well as X steering North, we should get the following results:—

"Y steering—

"South. Ships red to red, and therefore clear.

"S. by W. The same.

"S.S.W. If X ports no collision, whatever Y does.

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"S.W. by S. Collision inevitable, unless Y keeps her course and X ports.

"S.W. If Y starboards, no collision, whatever X does.

"S.W. by W. The same.

"Then the same for every other crossing angle until Y is steering north.

"In every one of these cases, except when X is steering north, and Y, S.W. by S., both ships are to do what Dr. Lushington said steamers ought to do, 'Seeing green to starboard, and seeing red to port.' When Y is steering S.W. by S., that is, when the courses are crossing at an angle of three points, she is safer if she does not alter her helm.

"It is obvious that the further apart we put the ships the safer it becomes to obey the signals made by the lights, provided, of course, that a change of colour in the light orders a change of helm.

"Such, then, was the manner and matter of the laws which the Conference had before them, and such the actual conditions governing the ships with which the law had to deal.

"I will not follow, as the Conference did, the bad example of treating the light before the rules, but will merely observe that a body like it was almost certain to stick to the form of the law as it stood, and not to perceive that the lights and signals follow the rules, and not *vice versâ*.

"Coming to the rules, their proposals are headed by a gallant attempt to define 'risk of collision.'

"They say: 'Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearings of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.' Now, though from my point of view the proper way to define 'risk of collision' is to abolish the phrase altogether, yet this preliminary statement goes a good way towards defining the cases for which any law is wanted. If we added after the word 'vessel' the words 'when she is steering towards the same point as your own vessel,' we should have a pretty complete basis of law. Or it might be put that the law should come into operation 'whenever one vessel approaches

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another without appreciably changing its compass bearing.' The definition of the Conference only seems defective inasmuch as it includes the cases of ships steering parallel courses at the same speed, or diverging courses at the same or different speeds, in neither of which cases is there any occasion for law.

"In existing Article 14, the crossing rule for sailing-vessels, the Conference made no change, except the verbal one of substituting 'vessel' for 'ship.'

"No doubt the object of such a body as the delegates must have been to change as little as might be, and it is not likely that many delegates were aware of the extreme complexity of this rule, and the entire want of principle in making a number of distinctions, which were at best a matter of opinion, to vary the action of one ship when approaching another under circumstances requiring common action to avoid collision.

"In the same way Article 15, the rule for steamers to port their helms when approaching 'end-on or nearly end-on' comes from the Conference with only the same verbal alteration. That is to say, the differences of opinion as to what the law meant, which sank the *Amazon*, *Osprey*, and *Princess Alice*, are left unsettled, no doubt from the cause mentioned above.

"Articles 16 to 17, the rules for steamers crossing and steamers approaching sailing-vessels, were left untouched.

"But it must be observed that these three crossing rules, so to call them, are only half rules. The one ship is ordered to 'keep out of the way,' on the condition that the other ship 'keeps her course.' This last order is contained in the existing Article 22. It ran: 'Where, by the above rules, one of two ships is to keep out of the way, the other shall keep her course.'

"The Conference proposed to alter the place of this rule, and to make a most momentous addition to it. They proposed it should stand: 'Where, by any of these rules, one of two vessels is to keep out of the way, the other shall keep her course *and speed*.'

"The great significance of this, aimed, it seems to me, directly at the fundamental error which has been at the bottom of the rule of the road trouble ever since 1863, will be seen directly.

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"The Conference proposed a new article to follow the last, in these words: 'Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case admit, *avoid crossing ahead of another*.'

"If we take these two rules together, and look at Diagram 2, we shall see there they as nearly as possible order X to port her helm, and not to starboard it.

"We have to recollect that this has been the bone of contention ever since 1867. It was held by those without authority, that by most, if not by all, the framers of the rules of 1863, the change of phrase from 'give way' to 'keep out of the way' was not understood to be a reversal of the old custom of the sea which forbid the giving way ship *absolutely*, to make a movement tending to take her across the bows of the other ship, and ordered her *absolutely* to use the helm necessary to take her under the stern of the other ship. But it had been laid down under the sanction and authority of the Admiralty, the Board of Trade, and the Trinity House, in 1867, that—

"'It is clear that the action (of X, the giving way ship) must depend upon the necessities of the case, and that the Legislature cannot make a rule to say that (X) shall always go one way or always do one thing. It must be left to the officer in command to do the best under the circumstances of each case; to recollect that his green light opposed to the red light of another vessel is the one position of danger; and, above all, to observe due caution.*

"It still seemed to those without authority, that the Admiralty at least were not fully alive to what they were sanctioning, because at that very time they gave the most positive orders to X, if she was one of Her Majesty's ships, to port her helm '*on all occasions*' of approaching Y under the rule. Authority, however, had gone still further, and had said that Y's red light was to X a signal 'to stop, or to go ahead, or to starboard, or to port, or to go astern, as the circumstances of the case (which obviously meant the opinion that X might have about the red light) might require.'

* "Regulations for Preventing Collisions at Sea." By Authority. Sixth Thousand, 1877, p. 14.

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"At the very least the two rules framed by the Conference are a direct challenge to what has been said by authority and now rules the Courts. They seem to ask distinctly, 'Why was the old principle reversed? and by what train of reasoning do you arrive at the conclusion that it is right in Fig. 3 to compel Y to keep her course, and wrong to compel X to port her helm?' Such proximity may arise as to make it wrong to order X to port her helm, but not a bit more wrong than to order Y to keep her course.

"A very little thought, therefore, goes to show that now the Conference has broken the ice, the words 'Keep out of the way' may presently disappear out of the rules, to allow for the restoration of the old well-understood and clear phrase, 'Give way.'

"And the change is momentous, because, as has been said, the coloured lights have lost their meaning as signals, under the existing laws, and we may be again reminded that no collisions connected with side lights occur, unless there is disobedience to their plain significance—unless there is porting to the green light on the part of Y, or starboarding to the red light on the part of X, or, too commonly, both disobediences.

"But look, again, at what comes out of re-establishing the coloured side lights as being definite signals, forbidding always certain helm, and in some cases ordering certain helm.

"In the Rules of 1863 there was an 'end-on, or nearly end-on' rule for sailing-vessels, which those not in authority always held to be a mischievous mistake, as confusing the meaning of the lights, and setting up doubts where none need arise. If ships are far from each other, and steering directly for one another, there is no reason why they should not ultimately pass as clear on the one side as on the other. And there is no inherent reason in the case why A, showing he intends to pass right hand to right hand, should not be allowed to do so by B. The only possible danger is that A should turn to the left, so as to pass right hand to right hand, at the same moment that B turns to the right, so as to pass left hand to left hand. The danger becomes more and more remote as the distance is greater between the ships; but still there is a danger, if there should be no rule to decide which ship was to go back to the old path.

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"The Committee of 1874-1877 abolished the 'end-on or nearly end-on' rule for sailing-vessels under the impression that this difficulty was met by the crossing rule which remained. That is, that if A and B 'end-on' and necessarily having the wind on opposite sides, should both luff, or should both bear up, and thereby make a danger, the one with the wind on the port-side would immediately find it her duty to 'keep out of the way' of the ship which had the wind on the starboard-side, and would, therefore, resume her course, and let the other pass her as she had decided to do. Or, otherwise, that the ship with the wind on the starboard-side would know that the ship approaching was bound to make room for her to go on. The reasoning is right, but is only prevented from applying with equal force to the steam rule for meeting 'end-on or nearly end-on' by the conception that 'keeping out of the way' did not necessarily mean abandoning all attempts to cross the bows of the other ship.

"I think that so soon as the Conference's view is adopted, it will be seen that the 'end-on or nearly end-on' rule for steamers—which is quite as wrong and mischievous as ever the rule for sailing-vessels was—will be shaken to its foundation. For if it becomes unlawful for one steamer to cross the bows of another leaving her on the starboard-hand, there will be distinct pressure—though there is no order—on two ships meeting 'stem-on' to port their helms, and pass port-side to port-side. Each will want to be right in case of accident, and to use starboard helm will be to run the chances of being wrong.

"Of course the whole idea of 'stem-on' cases is fallacious. There are not, and cannot be such things but as exceptions, and for moments of time. No ships steer steadily enough to preserve such a position, and in any case if the coloured lights are fitted according to law, only one of them can be seen at a time and the position of the ship's line of keel can be determined much more accurately at night that it can be in the daytime.

"I dwell upon these fundamental matters because everything else connected with the rule of the road is of little account beside them.

"It necessarily followed that the existing Rule 18 ordering (or not ordering, for the language is known to be doubtful) steamships to

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slacken speed on approaching other ships 'so as to involve risk of collision' should be altered. The Conference propose it as follows, to apply only to the giving way ship :—

"'Every steam-vessel which is directed by these Rules to keep out of the way of another vessel, shall, on approaching her, if necessary, slacken her speed, or stop, or reverse.'

"Here, again, the Conference followed the form. But I believe my opinion is a sound one, that if the rule does not *order* a ship to slacken speed, &c., it should not appear at all, as it is no rule. It would, I believe, be just as reasonable to add 'or shall put on extra steam if necessary,' and yet people would be startled if such a thing were done. When the helm is prescribed, the question of speed is either one for an order, or not to be mentioned. As a fact X, in Fig. 3 or 4, cannot make herself worse by slackening speed, and yet it may be quite unnecessary. All that the Article has ever done seems to me to be to raise questions in the Courts where seamanship and law find themselves at loggerheads over the words 'if necessary.'

"The Conference made another gallant attempt to define the word 'overtaking,' and put it that the faster ship was 'overtaking' when she was coming up with the other ship from a direction more than two points abaft the beam.

"Though my opinion is clear that the way to explain 'overtaking' is to do away with the word and the rule, yet I am bound to say that the Conference have admitted the principle that if a rule is made there must be signals to fit it. They propose that a stern light should show so as to cover the horizon not covered by the side lights, but not to overlap them. In this way a ship seeing the stern light only, will be aware that she is an overtaking ship, and presumably the other, by showing the stern light assumes the *rôle* of the overtaken ship.

"In prescribing speed in fog, the Conference was much pressed by a great variety of opinions, but in my judgment it has been right in resisting and leaving the order to stand that ships are to go at a 'moderate speed' in thick weather. However little it may be understood, the fact is perfectly clear that it is wrong helm and not great speed which makes collisions in fog. I believe

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I have hardly heard of a case where wrong helm was not used, and where the collision would not have happened whatever the speed might have been."

The Admiral concluded his paper by a *resumé* of the proceedings of the Conference on other questions. This we have already done in our March number. We have devoted much space to this paper owing rather to the special importance of the subject than to a feeling that Admiral Colomb's views are making any headway.* In the discussion which followed he found absolutely no support in his main contention, as will be seen by the brief account of the debate for which we are able to find space. It was begun by Mr. Baden-Powell, of the Admiralty Court, a nautical man, and an officer in the Royal Naval Reserve. In the course of his remarks, he said that in the whole of his experience in the Admiralty Court he could not point to one single case in which the rule of the road had caused a collision, or even aided in a collision. There had always been negligence on one or both sides—negligence to which the collision could be attributed, and which the best rules would never prevent. The experience of the Mercantile Marine was that the rule of the road was perfectly well understood by intelligent officers, and it was as a rule careless men, who would not rouse themselves to the state of things with regard to other ships in their neighbourhood, who, as a rule, got into collision.

Admiral de Horsey agreed with the last speaker that the rule of the road was responsible for few collisions, which were really caused by bad look-out, by ignorance of the rules, or by neglect of the rules when known. Admiral Colomb had said that he preferred the expression "Give way" to that used, "Keep out of the way." He, himself, was of opinion that the latter was the best, for no one could give two meanings to it, whereas, "Give way" was a seaman's expression for going off the wind, and as this was not the sense in which it would be used, were Admiral Colomb's wish fulfilled, it would lead to confusion among sailors.

Admiral Bowden Smith, who was one of the English Delegates at the Conference, said that he was not at liberty to say as much as

* This question was dealt with at length in *Nautical Magazine*, November, 1888, p. 921.

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he would desire in this discussion, as the report of the Conference had not yet been presented. Some of the delegates at the Conference had proposed to extend the range of the lights, but that proposal was resisted by the majority on the ground that what was wanted was not an alteration of the existing rules, but better supervision. It was shown that no inspection was exercised with regard to the greater number of sailing-ships that went to sea. The Commissioners spent two whole days in trying to define "moderate speed," but failed to do so. He approved the proposed alteration in the crossing rule. They wanted to make it perfectly clear that the holding on ship was to have the right of way in every sort of way, and that the giving way ship might do anything she liked when there was risk of a collision, except cross the other steamer's bows. Admiral Smith concluded by some remarks upon coloured glasses. Side lights were by the rules to be visible for two miles, but one of the Austrian delegates said 90 per cent. of the light was lost in consequence of the use of coloured glass, while a report of certain experiments in Germany showed that red lenses absorbed 60 to 80 per cent. of light, while green lenses absorbed 90 per cent. American investigations differed somewhat in results, but supported the view that an enormous amount of light was lost.

The next paper was by Professor Jenkins, of Glasgow University, and was entitled:

"The Strength of Ships, with Special Reference to Distribution of Shearing Stress over Transverse Section."

This was a very able paper on a most abstruse and difficult subject, and, taken in conjunction with a paper read at the next day's meeting by Mr. T. C. Read, represents a large and distinct advance in the theory of naval architecture. Mr. Read's paper is entitled:

"On the Variation of the Stresses on Vessels at Sea due to Wave Motion."

These papers would not be intelligible to readers who were not familiar with previous investigations on the difficult question of the

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stresses to which ships are subjected when among large waves; we therefore do no more than mention them.

The concluding paper at this meeting was by Mr. F. Goodall, and was entitled:

"STEATITE AS A PIGMENT FOR ANTI-CORROSIVE PAINT."

Mr. Goodall believes that he has solved the difficulty of the protection of the iron and steel of ships from corrosion by the use of the mineral *steatite* commonly known as "soapstone." This mineral is a soft magnesian rock generally associated, in its natural state, with serpentine, chlorite and talc, and is found in China, Chili, Italy, Germany, and England. It is incombustible, is a non-conductor of heat, an insulator, and is not affected by the acids which attack most metals. The smooth soapy touch of the material is due to the extreme minuteness of the particles of which it is composed, and it is this property which renders it possible to write with it upon plate glass. To this is attributed its value as a basis for protective paint, enabling it to secure without the slightest chemical action, full and permanent adhesion to the close fibre of iron and steel, which most protective paints have failed to do. Steatite is, in the protective composition described by Mr. Goodall, embodied with a quick drying varnish. The varnish should contain evaporating spirits, combined with a certain proportion of slow drying oils, in order that the paint may dry and at the same time keep its elasticity. Varnish alone is porous, and admits the atmosphere and moisture to the body to be coated with it, but when mixed with steatite, owing to the minute particles of which steatite is composed, the fine pores are completely closed and the paint becomes air and water-tight. Mr. Goodall believes that this composition will be effective against the causes of corrosion, viz., contact with sea water and the various acids it may contain, atmospheric influences and galvanic action. To obtain an effective composition is of the highest importance in the face of what is now so frequently noticed as regards the rapid corrosion of steel ships.

In the brief discussion which followed the paper, Professor Lewis pointed out that the chief influence in any composition for ships' bottoms would be exercised by the vehicle of which they are

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composed. Thus, if steatite were mixed up with varnish, the small particles would become surrounded by the varnish, and in that case the special virtue which enabled it to be used for writing on plate glass would disappear.

At the evening meeting on the 27th, there were three papers read, the first by Mr. C. E. Stromeyer, entitled :

"The Distribution of Evaporation in a Marine Boiler."

This was a paper of a very technical character, which it would be impossible to abridge. It was followed by a paper by Mr. A. Betts Brown, entitled :

"On the Application of a System of Combined Steam and Hydraulic Machinery to the Loading, Discharging, and Steering of Steamships."

A paper was read before the Institution by Mr. Betts Brown in 1884, and since that period, having fitted fifty steamships with the machinery, several improvements have been made which are described in the paper. A hydraulic derrick, a steam derrick, a steam tiller and telemotor are described at length. We have not space to reproduce the paper, and it is impossible to abridge it. The closing paper was by Mr. Arthur Rigg, and was entitled :

"The Revolving Engine Applied on Board Ship."

It described a type of engine adapted for high velocities, and high steam-pressure which has been used for driving dynamos, and has also been fitted in a steam-launch, but is at present only proposed for small vessels. It has three or more cylinders, which are arranged radially round an axis, in which are the steam-pipes, and the whole system of cylinders revolves round this axis when the engine is in motion. We have not space for a detailed description of it, nor would it, with the present purpose of the inventor, be of much interest to our readers.

On the morning of the 28th, the first paper read was from the pen of Captain C. C. Penrose Fitzgerald, R.N., and was entitled :

"On Leak Stopping in Steel Ships."

This paper dealt with the question how best to stop shot holes in steel ships. Various devices have been suggested as substitutes

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for armour—cellulose, woodite, india-rubber and other substances have been experimented with—but there appear to be grave objections to all of them. Captain Fitzgerald proposes to sheathe the ships outside from 5 ft. below the water-line to 10 ft. above it, with five-inch wood plank, preferably English elm, this offering the only reasonable prospect of being able to cover or plug shot-holes temporarily, and thus keep the ship afloat after an action. He proposes that his plan should be practically tested by firing at two ships, one so sheathed, and then see how the holes could be stopped in both cases.

The next paper was that already referred to (by Mr. T. C. Read); it was followed by a paper from Professor V. B. Lewis, on THE SPONTANEOUS IGNITION OF COAL CARGOES. The latter, on account of its great value and importance, we propose to notice at length in a future number. The evening meeting on the 28th was opened by a very interesting paper by Mr. J. Corbett, entitled:

"EXPERIMENTS WITH LIFEBOAT MODELS."

Mr. Corbett is the local honorary secretary for Manchester of the Royal National Lifeboat Institution, and for twenty years has been collecting information with regard to lifeboats, but has devoted very special attention to the subject since the disaster to the Southport lifeboat three years ago. He exhibited models to scale of several existing boats, and has tested them in sea waves and breakers of proportionate size to ascertain their behaviour in rough weather and surf. He also exhibited curves of stability for each type obtained by practical inclining experiments. Altogether the paper gave evidence of a large amount of intelligent labour and research expended in the purely philanthropic purpose of improving the lifeboat service on our coasts.

The types selected for comparison by models were:—

No. 1. The Norfolk sailing lifeboat, a broad and shallow boat with huge fenders projecting from its sides. The whole space beneath the deck is filled in by detached air cases except where occupied by loose water ballast. There are no seat-thwarts, and when oars are used the men stand to them. The loose water-ballast is in open central spaces; water also lodges among the

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timbers in the space between the air cases and the outer skin of the boat. There are open tubes through the bottom, to discharge any water coming on board. The load displacement of this boat is about 16·6 tons and its total bulk to gunwale about 42 displacement tons.

No. 2. The Tubular lifeboat in use at Liverpool, as built in 1877, is broad and shallow, and for stability and buoyancy depends upon the two tubes forming its main structure. It has no ballast whatever, and as originally designed had a deck of open battens, and open spaces between the tubes and the topsides, so that no water could remain on deck and a sea could pass across it or through it without much liability to capsizing. This arrangement was intolerably uncomfortable for the crew, and recent boats built on this plan have a nearly close floor and close sides. The load displacement of the New Brighton boat is 8 tons. A new tubular lifeboat was supplied to the New Brighton station in 1888.

No. 3. The large sailing self-righting lifeboat is an extreme example of the self-righting type. Its high end air cases seriously hinder its progress to windward, while at the same time they give an excessive height of side exposed to a blow of a sea. The ballast is chiefly in the iron keel and the iron drop keel and casing, but there are some closed tanks intended for ballast if the iron drop keel is lost. The load displacement of this boat is 9·8 tons, and it is self-righting, either empty or with crew and gear on board.

No. 4. The self-righting boat of 1862 for rowing or sailing is so shallow and heavy as to be only just self-righting without crew or gear. Its load displacement is 5·3 tons.

No. 5. The self-righting lifeboat of 1887 for rowing or sailing is a modification of the last one, and is self-righting either empty or with crew and gear. To obtain this the end air cases are made larger, the beam decreased, while the boat is fuller at the ends, and the draught increased. The displacement is about the same.

Mr. Corbett then went through the qualifications required in a lifeboat, and considered how each type furnished them.

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As regards the form of side and gunwale, he considered it important to have as little side above water as possible, and to have a tumble home side above water, in order that the blow of a heavy wave might merely drive the boat before it but not capsize it. A self-righting boat must have large air cases above water, and in this respect as well as in others the qualifications needed to secure self-righting are also those which tend to easy capsizing. For sailing or rowing to windward against a heavy sea, the bow should be fine in form, and should have a considerable surplus of buoyancy so as to rise to each wave, but not such an excess of buoyancy as would lift it high above the wave, causing it to lose way or to give the wave a chance to turn the boat end over end. The bow should be decked over for some length so as to permit of running into a wave and rising through it without taking much water on board. The stern should have fine lines below, but a full water-line, and should not be high out of the water. In running before the sea and especially in landing through heavy breakers the great desiderata are that the bow shall have ample buoyancy to prevent its burying when a wave overruns the stern, and that the stern shall have a deep grip of the water and comparatively low sides to prevent its being turned aside by the blow of a sea on one quarter, the most frequent cause of broaching to and capsizing. Being overtaken and pooped by a following sea, the direst peril of an open boat running through breakers, is comparatively harmless to a lifeboat whose buoyancy depends on air cases, and therefore a low stern with somewhat deep keel and a high bow with considerable surplus of buoyancy will best meet the requirements. Thus whether rowing or sailing to windward, running free, or running before the sea, a fine bow with considerable surplus of buoyancy, and a broad stern with but a moderate surplus of buoyancy seems safest and best for lifeboat work.

Comparing the different types of boats as regards resistance to propulsion due to the form of bow both above and below the water-line, the Norfolk boat has an immense advantage above all the others—in respect of its power of facing rough water and holding way through a sea. As regards stability the Norfolk boat has its greatest stability at 32 degrees, of the high amount of 22·1 foot

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tons; the tubular boat at 30 degrees, of the amount of 22·5 foot tons. The large sailing self-righting boat has a maximum of 12·4 foot tons at 35 degrees; the self-righting rowing boat 4·4 foot tons only at 27 degrees, and the boat of 1887 3·5 foot tons at 36 degrees.

It may be mentioned in this connection that a type of lifeboat proposed by Mr. Corbett, as embodying a fair balance of the most desirable qualities would be of 6·7 tons displacement. It would have a maximum stability of 9·1 tons at 33 degrees. The new Southport sailing lifeboat, designed by Mr. G. L. Watson, is 19 tons load displacement, and is not self-righting. It has a maximum stability of 45 foot tons. It is 43 ft. in length, 13 ft. beam, has low-water ballast-tanks, large air-cases and other improvements on the old Norfolk type, upon which it is based.

Coming to the important question of self-righting *versus* non-righting, Mr. Corbett thinks the former quality is of great value, but that too great a price may be paid for it. But a boat of shallow draught can only be made self-righting by limiting its beam, and hence its stability at all working angles of heel, in order that the "shoulder stability" shall not, when capsized, annul the righting tendency due to the position of the centre of gravity. The officers of the Lifeboat Institution have recently effected a great increase in this quality of their boats, by the enlargement of the end air-cases, greater rise of floor amidships, the addition of two inches depth of keel and reduced beam in the 1887 as compared with the 1862 boat. But this increased righting-power, when capsized, is obtained by sacrificing one-fifth of the stability when not capsized; and it is quite evident that the common statement that the features which give the self-righting power also increase the stability of a lifeboat is utterly erroneous and misleading. It appears certain that the frequent disastrous capsizes of the small rowing lifeboats might be almost always prevented by giving them considerably more stability, for of the larger self-righting boats, ranging from 37 ft. by 9 ft. upwards, only one, the Thorpness boat, has capsized on service. It is possible, Mr. Corbett concludes, by ballasting and by a modification of the usual proportions of the boat, without any increase of draught or of weight when on shore,

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to provide a lifeboat with fully two-fold greater stability, and with three-fold more resistance to capsizing by a sea than a self-righting lifeboat has; and he submits that this greater stability, with better rowing or sailing qualities, would amply compensate for the absence of the self-righting quality.

The remainder of the paper was occupied by a description of a design for a lifeboat, not self-righting, but with large stability, and embodying the qualities believed by Mr. Corbett to be the most desirable. Mr. Corbett also put forward a proposal for models of larger size, in fact, lifeboat canoes, to be built in order to have exhaustive trials of the various kinds of lifeboats. Such models would not involve a very great expense, and trials with them would be more practicable than with full-sized boats, inasmuch as weather could be chosen in which the waves would bear the same relation to the size of the canoes that the waves during exceptionally heavy gales do to the full-sized lifeboat.

Captain Chetwynd, the Chief Inspector of the Lifeboat Association, supported the self-righting boat at some length. He gave particulars of the number of capsizes and the loss of life during a considerable period, showing that, for the work done, it was really very small. He also stated that the opinions of the coxswains of lifeboats had been asked on the question, and there were a large majority in favour of the self-righting boat. It appears to us that the statistics given proved rather the general efficiency of the Association, and its boats, and their crews, than the superiority of the self-righting type. What was needed was a comparison of the number of accidents and the loss of life in proportion to the number of times the boats were out on service. If this were got out for the self-righting boats, and also for the other types of boat, such as the Liverpool and the Norfolk boat, an idea could be obtained of the liability to accident involved by self-righting as compared with stiff non-righting craft. Mr. G. L. Watson, of the Clyde, who for the last three years has held the post of Naval Architect to the Association, also expressed his approval of the self-righting principle for small boats, but was somewhat doubtful of its value in the case of the larger lifeboats. Altogether, it would appear that Mr. Corbett has

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made out a case for further enquiry, and doubtless the Association which has done its work so efficiently and intelligently in the past, will thoroughly thresh out the question which Mr. Corbett has brought forward with so much ingenuity, intelligence, and devotedness.

The concluding paper was by Mr. Jas. Howden, and was entitled :

"On Various Theories of the Screw Propeller."

Mr. Howden differs regarding the theory of the screw propeller from most authorities who have hitherto dealt with the question, including Professor Rankine, Dr. French, Mr. R. E. Froude, Professor Greenhill, and Professor Cotterill. This paper is, we need hardly say, of a very abstruse character, and it would be impossible to abridge it, or to present the arguments in a simple form.

DYNAMICS OF THE ATMOSPHERE.

ALTHOUGH it does not appear that exact knowledge has been arrived at concerning the originating causes of the great gales, tornadoes and other violent commotions of the atmosphere which frequently occur and occasion great havoc to life and property, yet a good deal of useful information has been acquired upon the subject. By means of barometrical indications, and by other observed and carefully collated effects, for instance, meteorologists can and do sometimes foretell the on-coming of a gale from such or such a quarter, and its probable course over certain specified localities, and the general behaviour of winds at sea—chiefly as recorded in ship's logs—has been for a long while industriously investigated, with the practical result that the navigator is often enabled to prepare for the onset of an advancing storm, or to direct his course away from the most dangerous parts of a cyclonic hurricane. After all, however, the study of meteorological phenomena may perhaps be regarded as

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having hitherto issued in little else than a useful knowledge of the modes in which atmospheric disturbances generally manifest themselves, rather than in an acquaintance with the primary causes from which they arise, or the laws by which they are regulated.

When some of the enormously powerful influences which are in operation at and around the surface of our globe are considered, it seems marvellous that effects are not produced in an infinitely greater degree than is manifested in the storms, cyclones and other disturbances which actually occur. From *à priori* reasoning it might be supposed, for example, that the centrifugal force at the earth's surface which, as astronomers inform us, is occasioned by the globe's rotation upon its axis, and which affects the ocean waters in greater or less degree, would be such that nothing whatever could resist its violence. Here, in the latitude of London, we are being whirled round, in a direction parallel with the Equator, at the speed of something under a thousand miles an hour, while the mean velocity at which, by reason of the earth's journey in orbit, we are being carried through space in a direction oblique with that of the diurnal rotation, is more than sixty thousand miles an hour, or upwards of seventeen miles per second! It needs little or no scientific knowledge to enable us to understand that under such circumstances no vestige of man or of his structures, or in fact of any movable thing whatever, could remain upon the earth for a single instant but for the requisite adaptations which so modify the action of Nature's forces that we can abide as comfortably upon that ancestral domain as if such things as the globe's rotation upon its axis and its motion through space and centrifugal force, had no existence whatever!

The like adaptations admit of the atmosphere surrounding the globe, *excepting what may be termed its tidal parts*, being similarly carried round along with the "crust" and body of the earth itself and with the *non-tidal* part of the ocean waters. The atmosphere is indeed sometimes described, and most appropriately, as being an attenuated ocean; and supposing it to be, as there is reason to believe it is, subjected to the influences which affect the ocean waters, though owing to its vastly greater sensitiveness, in an incomparably larger measure, then is there little

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difficulty in accounting in a general way for the great variations of condition by which it is so obviously characterised. If, for instance, there be atmospheric tides just as there are oceanic tides, with the addition of temperature as a potent element in connection with aerial movements—the presence of which element in varying degree is probably due to external astronomical causes—then it would seem that there must necessarily ensue effects similar in character to those manifested by the ocean waters. Among such effects would be atmospheric movements equivalent to the apparent semi-diurnal rise and fall of the water. More or less established air currents in different latitudes, such as the trade and other permanent or periodical winds for instance, would be another result, with numerous alternating variations. Subordinate currents now in this direction and then in that should occur. The semi-diurnal recurrence of the tides of the ocean waters must of themselves alone affect the superincumbent atmosphere, first, by raising those parts of it which repose upon the waters concurrently with the rising tide, and then, conversely, by inducing its descent through the relapse of the tidal ebb. Another influence is the moisture with which it is charged in the form of attenuated or invisible vapour, or in that of clouds of different density and bulk. The radiation of heat from the earth in constantly varying degree contributes its quota towards the vagaries of aerial movements, while the superficial configuration of the globe, comprising its mountains, hills, and valleys, performs a part in the production of the ever varying conditions of the lower strata of that vast atmospheric ocean at the bottom of which we dwell.

Although considerable knowledge respecting atmospheric effects has been so acquired after many years of indefatigable observation, yet meteorologists would probably have a hopeless task if they strove to trace the primary influences and laws which produce and govern the movements of the air, by merely tracking the winds and recording their direction and velocity, with the other innumerable and ever varying details of atmospheric phenomena which are developed at the earth's surface.

Conversely, if the globe itself with its ocean waters and its surrounding atmosphere, may be rightly regarded as forming

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together but one entirety, and as being *altogether* affected and regulated by the same general influences, though in a degree which differs according to the difference in density of its three respective portions, then have we at hand a promising hypothesis by means of which reasonable explanations of many details may be deduced. If, for instance, the atmosphere which surrounds our globe is held thereto by the same influence which retains the ocean waters upon it—namely, the terrestrial gravitation—it necessarily follows that the sun and moon also exercise upon it a gravitating influence, and that atmospheric tidal effects must be thereby occasioned, just as the tide of the ocean waters are produced by those causes.

By analysing the circumstances out of which the semi-diurnal tides of the aqueous ocean are evolved, and by applying the same course of reasoning to the atmospheric ocean, it seems to be reasonably inferable that the state of the latter is ever progressively and retrogressively subject to alteration, and that, owing to its being most sensitively amenable to the various influences with which it becomes intermixed, it is liable to vastly greater vicissitudes of condition than are the oceanic waters themselves.

In a former number of this journal an endeavour was made to trace the mode in which tidal phenomena are developed. Some of the circumstances there referred to as combining to produce tidal effects may be briefly recapitulated.

The semi-diurnal ocean tides, then, arise through the water being affected by the gravitating power of the sun and the moon in such manner that the power of terrestrial gravity which holds the water to the earth, is thereby overcome in comparatively small measure, causing the waters to be drawn out into a so-called wave at places over which the luminaries, respectively, are most nearly vertical, and at places diametrically opposite thereto; that is to say, in such a way that the vertex or deepest part of each wave is thus situate. Hence is there in one hemisphere either a direct solar tidal wave, and a direct lunar tidal wave, while in the opposite hemisphere there is a counterpart of each such wave, or else on each hemisphere there is one of such direct tidal waves and a counterpart of the other tidal wave. But because the paths apparently described in the heavens by the two luminaries respectively do not greatly

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diverge from each other, so the two waves and their opposite counterparts follow paths that are not greatly divergent. At the times of new and full moon they become nearly commingled, and higher or "spring tides" are a consequence. Then, as the moon travels from either of those positions, the two waves in each hemisphere separate from each other until the moon arrives in quadrature, when "neap tides" occur, and the two waves then begin to approach each other until the moon again arrives in conjunction, or opposition, as the case may be.

But the daily tidal effects manifested upon any open coast or sea shore are *not* the consequence of the so-called tidal waves passing round the globe synchronously with the apparent ebb and flow of water, for their production being due to the solar and lunar influences, their vertices or deepest parts are always at those deeper parts of the ocean over which the two luminaries are most nearly vertical and at the diametrically opposite parts of the globe, and certainly the sun and moon in producing the tidal waves do not revolve daily round the earth. In fact the tides are due to a converse course of events—namely, by reason that the globe's diurnal rotation is ever bringing the ocean bed under a deeper or shallower part of the tidal wave. But though the tidal waters do not pass round the globe daily, they do travel round it in longer periods, namely, that part which is due to the moon's attraction, once in the course of each lunation, and the part which is produced by the sun's influence, once in the course of each year.

Another element which cannot but enter into the combination of circumstances which produces the tides, is the local variation of terrestrial gravity. Astronomers inform us that the force of such gravity is less at the equator than at the poles and increases in some small ratio according to the increase of distance from the equator towards the poles. Hence the earth's diurnal rotation, the direction of which is parallel with the equator but oblique with the ecliptic, is always bringing each parallel of geographical latitude under different parts of the tidal waters, whereby the tidal water is being subjected at every instant to a different degree of terrestrial gravity from that to which it was subject the instant previously.

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The tidal waters of the ocean are therefore subjected to a ceaseless conflict between the disturbing and ever varying forces exercised by the sun and the moon and the earth respectively, but in a manner which is recurrent and is being ever repeated in enhanced or diminished degree. Hence, besides the daily tidal alternations, other established effects ensue, in the form of ocean currents, some of which are temporary, while others are of a more or less permanent character.

Now if the aerial ocean beneath which we dwell is properly regardable as part and parcel of our planet—as one of its tripartite members in fact—then, reasoning from the general laws or data concerning the ocean tides which astronomical experts from Newton onwards have from time to time announced, and applying that reasoning to the atmosphere, there would seem to be reason for concluding that the atmosphere is so influenced by gravitation that two or more daily tidal alternations are generated in it—an effect being this, that while the atmosphere, excepting its tidal parts, is by the earth's rotation upon its axis, carried round with the earth's solid mass, and with the non-tidal parts of the earth's ocean waters, the tidal parts or tidal waves of the atmosphere are *not* so carried round.

Let it be imagined that the atmosphere is drawn out towards the sun and moon, so that tidal waves are produced similar to those of the aqueous ocean, but of vastly greater depth owing to the enormous depth, and the greater tenuity of the atmosphere. Those waves are not carried round the earth by means of the earth's diurnal rotation, but the earth's surface and the non-tidal part of the ocean waters, and the non-tidal part of the atmosphere revolve within or beneath their lowermost portions. But they *do* travel round the earth—the one in the course of each lunar month, and the other in the course of the earth's annual journey in orbit. The paths in which they thus respectively travel are somewhat divergent from each other. The lunar atmospheric wave, and the solar commingle at the times of the moon's conjunction or opposition. At other times they are travelling from or towards each other. Their paths are oblique with reference to the direction of the earth's diurnal motion upon its axis which is parallel with the

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Equator. And the force of the earth's terrestrial gravitation varies locally, according to latitude. Herein, then, is a most intricate and ever-changing combination of influences, to which the subtle element or material which constitutes the atmosphere, is being constantly subjected. But those influences are of a character which seems to admit of their effects being capable of generalisation, for though altering they are partly or entirely recurrent. A consequence ought to be regular diurnal atmospheric variations, such as meteorologists inform us actually occur. Semi-monthly progressive and retrogressive effects should arise from the moon's journey in orbit. There should come times, as at or near the equinoxes and the solstices, when the direction of the centrifugal force generated by the earth's diurnal rotation on axis, and that generated by its motion in orbit, enter into closer conflict, and cross each other within a narrower compass than at other times, resulting in vortices or in such violent commotions of the atmosphere as would perhaps have a spiral and gyratory or a cyclonic character. And there ought also to ensue general established aerial currents such as the trade and other permanent winds, characterised, however, by gradual and periodical changes of direction.

Such are some of the general inferences to which an analysis of the astronomical influences whereby the atmosphere is affected would seem necessarily to conduct us. They are identical with those which produce the daily and other tides and the various currents of the aqueous ocean. But just as the denser solid earth, with its aqueous and atmospheric oceans, and including its satellite, is affected as if it were one entirety, by the various influences of gravitation which are external to it, so that the form of its orbit and its varying motion through space are thereby determined, so are the less dense ocean waters, and the still more attenuated atmosphere thereby affected in a degree surplus and beyond that which thus affects the globe as a tripartite whole.

With the general results thus emanating from these primary causes, numerous incidental influences enter into that great arena of atmospheric conflict, but for which the earth would probably be surrounded by a stagnant pall whereunder there could be no

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life. Differences in temperature, varying generally according to the position of the globe in its orbit, and more or less geographically according to the position of the respective parts of the earth's surface relatively with the sun in declination, and differences in the amount of moisture, ever changing according to the progress of the seasons, and caused by the vast and continual, though always varying, uprising stream of evaporation—the radiation of heat from the earth—the condensation of vapour and its return to the earth in its different forms—the tidal rise and fall of the aqueous oceans themselves—the effect of refrigerating influences towards polar regions, and its reaction upon the atmosphere of other latitudes—the interception and deflection of aerial currents by hill and mountain ranges—are some among the innumerable causes of healthy, though sometimes appallingly destructive disturbances to which the vast attenuated ocean above us is liable. And when in addition to these operations and effects, which proceed upon so enormous a scale and in so intricate a fashion, there enter into the combination the unseen and infinitely more marvellous and subtle influences of chemistry, which would seem to be in unceasing action in the solid earth, and in ocean, air and space, and probably throughout the universe itself, it is hardly surprising that, living as we do in the comparatively calm depths of that great aerial ocean, there should occasionally descend upon us some relatively infinitesimal manifestations of the stupendous forces by which the motions and the general conditions of our terrestrial habitation are regulated.

The foregoing are mere generalisations concerning the ever-varying but ever-recurrent dynamical influences to which it cannot but be that the planet we inhabit, including the aqueous ocean it carries upon its surface, and the atmosphere surrounding it, is continually subject, if the globe and its satellite have the motions ascribed to them by astronomical theory, and if the wondrous universal influence to which the name of gravitation has been given is exercised by the sun and by the several members of our solar system in the manner indicated by that theory. The history of astronomy furnishes numerous instances of the important and sometimes fundamental modifications which the experts in that

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particular branch, as in every other branch of physical science, find it necessary to adopt from time to time; and it seems probable that much remains to be done in that direction, especially in connection with oceanic and atmospheric phenomena. And it is not from the work of the land observatory alone that increased knowledge concerning astronomical effects and their immediate or proximate causes may be expected, for it is upon and over the open ocean that the dynamical forces of nature, so far as they operate at the globe's surface, have the most free scope for the exercise of their influence, and therefore it is the educated nautical expert who has it specially in his power, by carefully observing and carefully recording the atmospheric and oceanic phenomena he witnesses, and by comparing them with the data furnished by authoritative exposition, to contribute to an important extent to the branch of physical science with which his profession is particularly connected.

R. G. M. BROWNE.

THE MARINE TRANSPORT OF PETROLEUM.

THERE has been no departure in the practice of shipping, stowing, and discharging cargo, of such great moment as has occurred by the adoption of the oil-in-bulk method of carrying petroleum, and although in previous issues attention has been drawn to some of the leading questions relating to this practically new trade, it will, we believe, be useful to many of our readers and of general interest to consider some of the salient points connected with the latest practice in the marine transport of petroleum.

In the most recent articles published in these pages* on the subject of the petroleum oil trade special attention was drawn to the low flashing point of commercial petroleum, and it was urged that the limit of the minimum flashing point should be raised from 73° to 100° Fahr. This is emphatically a question demanding the

* *Nautical Magazine*, February, 1889, pp. 105—8; May, 1889, pp. 397—400.

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early attention of our legislators, and in a recent work on the subject* it is pointed out that even raising the legal limit to 120° Fahr. would not be inflicting a hardship on the manufacturer, and would ensure a safety of life and property which would outweigh the slight increase in the cost of illuminating oils.

While, however, legislation may be necessary to assist in obtaining reasonable safety in the carriage and handling of petroleum, knowledge and carefulness on the part of those engaged in the traffic are absolutely essential. There have been some serious disasters besides minor casualties, and in nearly every instance, ignorance and carelessness were contributory causes. As the over-sea carriage of petroleum is certainly not decreasing, even to countries in which for illuminating purposes it has to compete with coal gas and the electric light (*e.g.*, the United Kingdom in 1889 imported 102,647,478 gallons as against 71,026,962 gallons in the year 1866), the danger of further disasters will not tend to decrease, unless there is enlarged knowledge and additional care exercised by those engaged in the trade.

Not only is there danger with a full cargo, but in oil-in-bulk steamers which have discharged their cargoes the risks are intensified, of which the *Petriana* and *Ville de Calais* disasters are instances. These risks are not, however, confined to the vessels actually engaged in the carriage of petroleum, as in crowded harbours and docks neighbouring vessels have been damaged, and although hitherto disastrous fires of very extensive dimensions have not occurred, it has been due, not to good management, but to Dame Fortune. In the recent casualty at Sunderland, in which the oil-in-bulk steamer *Wildfire* and other vessels lying on the river Wear were seriously damaged, the cause of the fire which occurred was the pumping of the water and oil drainage out of three of the tanks, and a red-hot rivet falling on the oil covering the water, caused it to burst into flames. Fortunately it was ebb tide, or the disaster might have been intensified, but, as it was, one life was lost by drowning, several workmen which were being taken off a vessel on fire having to dive into the river to escape being burnt to death, their boat being enveloped in flames. A second fire of a

* *The Marine Transport of Petroleum*, by George Herbert Little.

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similar nature occurred later when the *Wildfire* was in the graving dock, but fortunately it was of much less extent. As regards the petroleum which had formed the cargo of the *Wild Flower*, Dr. Dupré, who made experiments with a sample of it, stated that it readily lighted by a flame or by a red-hot solid. Whether this be so or not, clearly no vessel should be allowed to cover the surface of the water in a dock or harbour with petroleum, and both masters and engineers of vessels engaged in the oil-in-bulk trade should in future take heed that no such liability to fire is occasioned, whether harbour authorities do absolutely prohibit the practice or not.

Reverting to the *Ville de Calais* disaster. This vessel had discharged its cargo of crude petroleum, and on October 16th, 1888, water was being pumped into one of the tanks to serve as ballast. It is believed an engineer had taken a light into the hold for the purpose of examining the tanks. At all events, by some means the explosive mixture of petroleum vapour and air which remained in the tanks was fired, and a serious explosion resulted. There is almost equally a risk of a similar disaster, even when only one barrel of petroleum is shipped. One gallon of petroleum spirit is enough to render 16,000 gallons of air inflammable, *i.e.*, a space exceeding 2,000 cubic ft., and the penetrating nature of the vapour increases the risk, so that along with the high specific gravity and flame-carrying power, the presence of a small quantity is highly dangerous. As the danger is common to all petroleum trading vessels, although more likely to arise in the case of oil carried in barrels, too great publicity can not be given to it.

Two disasters have occurred when the cargoes consisted of barrels. The small wooden schooner *Catherine*, of 85 tons, loaded with 367 barrels of petroleum spirit or benzoline was lying at anchor in the Thames preparatory to sailing on July 19th, 1889, and although the master of the vessel had been warned not to permit any light or fire on board, and a fire was in use, and the vessel blown up, with loss of life. Another case under similar circumstances was the loss of the sailing barge *Charles Little*, also laden with benzoline. In the former case, the oil it was stated gave off an inflammable vapour at less than 73° Fahr., and in the

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opinion of Professor Redwood happened by vapour coming into contact with the flame of a fire in the forecastle, to which the vapour had passed from the hold.

Another instance of disaster is the steamship *Sumatra*, of 1,884 tons register, laden with petroleum in tins inside wooden cases, in which a fire broke out, and had to be abandoned on February 26th, 1889, about 67 miles from Damietta, off the Egyptian coast.

Again another occurred at Rouen, on board the steamship *Fergusons*, in December, 1889. This vessel is fitted up with tanks, built in and distinct from the hull, and had discharged a cargo of crude petroleum which had been shipped at Philadelphia. One of the crew went below to shut the cocks in the filling and discharging pipes, having with him a portable electric light. An explosion occurred, and the man was never seen again. Dr. Dupré, who gave evidence at the inquiry, said he had seen a model showing the manner in which the wires of the portable electric lights were connected to the main cables, and in his opinion it would be difficult to avoid sparks arising from the electric lighting arrangements, and sparks would be quite sufficient to fire the explosive vapour. In this instance the element of designing the tank arrangements had considerably to do with the disaster. No vessels are now converted for the oil-in-bulk trade as the *Fergusons* was, but it is also evident that even with electric light there is not necessarily an immunity from explosion. In our limited space, we cannot indicate all the precautions necessary to an efficient system of the electric lighting of petroleum vessels; but one of the most important details may be noticed. In such vessels instead of the single wire system, with the hull of the ship as the return lead, the two-wire system should be adopted, and although more expensive in first cost, it is probably in all cases the cheapest in the end. Often with the single wire salts form on the joint between the lamp wires and the ship's skin, and introduce an electrical resistance, causing the lamps to burn dimly and unevenly; and there is great trouble in testing such currents and localising defects. Having in view the *Fergusons* disaster, it is also important that all the flexible leads for hand lamps, &c., should be additionally

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protected with a sewing of spun yarn, as petroleum tends to soften and destroy the insulation.

Fire and explosions are not the only dangers to which oil-in-bulk steamers are peculiarly liable. The question of stability is in their case more than ordinarily of moment. Here again the element of design comes to the fore. With ballast tanks under the oil compartments there is greater liability to instability should part of the cargo find its way into an empty ballast tank. This increased risk along with other inconveniences appears now to be generally realized by shipbuilders and shipowners, and double bottoms in the wake of oil compartments are rarely, if ever, now adopted in new vessels.

This danger of having a loose body of water or oil in the water-ballast tanks is apparently not recognised by all shipmasters, at all events it has been alleged that "the number of vessels laden with homogeneous cargoes that have foundered at sea through the loss of stability occasioned by the attempt to obtain it—by admitting water into the tanks—is beyond comprehension." Whether this be true or not, there is no doubt that stability requires special attention in oil-in-bulk vessels, but more especially in discharging and loading. The vessel should be upright before commencing either of these operations and kept as near upright as possible during their progress, and in the opinion of Professor Jenkins every master of a vessel should have the following information supplied to him by the shipbuilder:—

First. The number and position of the tanks to be simultaneously filled at the loading port, from the commencement of the loading to its completion.

Second. The number and positions of the tanks to be simultaneously emptied at the end of the voyage, from the commencement of the discharge to its completion.

Third. The number and positions of the tanks to be filled with fresh water for the return passage, so as to give a proper trim and sufficient stability, together with the order in which they should be filled.

Fourth. The order in which the water tanks should be pumped out on arrival at the loading port.

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In the recently published work on *The Marine Transport of Petroleum*, already referred to, the question of loading and discharging is considered in detail. We cull only one or two hints. "If you start on one tank, do not leave till you have filled it; and always empty one tank before commencing on another." The directions as to the best method of cleaning out oil compartments are also worthy of note, and it is urged that when examination and cleaning processes are in progress, there should always be some one stationed on deck to give an alarm if it should be necessary, as the fumes of petroleum produce on many people the effects of intoxication, and accidents have occurred to men overcome by the vapour.

Important details are often overlooked in the equipment and fitting out of vessels, in which there are great departures from ordinary practice. Amongst the number specially important in the class of vessels engaged in the petroleum trade, is that it should not be possible for any leakages of oil to get into the engine and boiler spaces, either through the bilge pump pipes or otherwise. It is therefore requisite to diverge from the ordinary practice of discharging the drainage of the entire vessel by the pump worked by the main engines. It has been recommended that it should be arranged that all leakage from the oil compartments should pass into a special chamber, from whence it could be pumped back either into the tanks or otherwise. Good ventilation at the time of loading and discharging, and when the vessel is in ballast trim, is also another matter demanding special attention; bell-mouthed ventilators should be fitted with a diaphragm of wire gauze, which should not expel foul air too near the deck. Special precautions should be taken when loading, as, at that time, the gas generated from the oil being pumped into the tanks is very considerable, and naturally rushes out of the ventilators in large quantities. As it may mingle with the air in such a proportion as to form an explosive mixture, the need of care is evident. Since the explosion of the *Ville de Calais*, experiments have been made to determine what proportion of air will cause this result, and it has been found that with five times as much air as petroleum no explosion will occur, but when the air is six times that of the petroleum vapour the mixture is feebly

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explosive, but violently so when from seven to nine times. With twelve parts of air to one of petroleum the mixture is still violently explosive, but with sixteen parts it is but feebly, while with air twenty times the quantity of the vapour, usually no explosion can occur.

With such liabilities to explosion, it appears highly desirable that the galley should have no fire, but that all food should be prepared by steam. Smoking may possibly not need to be prohibited in well-designed vessels with good ventilation, where ordinary care and prudence is exercised, but, as a matter of precaution, the crew should engage in the articles to cease smoking at the request of the master of the vessel. Oil lamps, or candles of any sort should not be permitted on board, and even matches should be prohibited in the opinion of Mr. G. H. Little, who suggests a dish of heated charcoal being provided for lighting tobacco-pipes.

Many other matters might be mentioned had our limits of space allowed. The question of testing the oil when loading and before signing bills of lading, and of regularly recording the specific gravity, flashing point and temperature when on the voyage are among the number. For ascertaining the specific gravity the Beaumé hydrometer is used, especially on the Continent. It is calculated to give a correct reading at 59° Fahr., or 15° C. In obtaining specific gravities from oil tanks, samples should be taken from the bottom, the middle, and the surface of the liquid, to ensure a really accurate result. Flashing tests can also be taken, with advantage, on Abel's system, although the actual Abel's tester cannot be used on board ship, except in port.

While we have been indebted to Mr. G. H. Little's work on *The Marine Transport of Petroleum*, and can recommend its perusal to those of our readers specially interested in the subject, it is perhaps to be regretted it is in many parts diffusive. Instances in large numbers might be given. The author states, *e.g.*, that "the educational status of 'extra masters' is about on a par with that of a Sixth Standard Board School boy," and that "one great cause of loss of life and property at sea is to be found in the low standard of education, or what passes for such, possessed by the average ship-masters." A case is instanced where, in an inquiry as to the

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collision between an oil-laden vessel and a steamer, resulting in the loss of the latter and the stranding of the former, it was stated by the master of the sailing-vessel that mineral oil cargoes affected the compass. "In this extraordinary statement he was supported by the evidence of another captain." The author goes on to say: "It is hardly possible to believe, in this age of examinations and technical education, that a professional man would be found to make such an unwarranted assertion. It is needless to state that mineral oil does not affect a ship's compass."

Further, we are informed, Sir W. Thomson, on being consulted, corroborated the view that mineral oil had not the alleged effect; and Mr. Little closes the paragraph as follows:—"It shows the extraordinary ignorance in technical matters that is as a rule possessed by those who conduct our Board of Trade Inquiries that none of the Assessors who were conducting the Inquiry were conscious of anything startling in the statement!!"

CHAIN CABLES.

THE history of shipbuilding in England during the present century tells us of two great and distinct changes as regards the material of which ships are built. From about 1840 to 1875 iron gradually took the place of wood, and from the latter date up to the present year steel has been gradually replacing iron, so that in 1890 but a very small percentage of ships in hand are being built of iron. Similar changes have come about in parts of the equipment of ships, but in the case of chain cables, which are the subject of this paper, only one such change has taken place. Early in the present century, the first practical steps were taken in the way of substituting iron chain for the hempen cables which had been in use from very early times; at about the middle of the century, the chain had pretty completely superseded the hempen rope; but although repeated attempts have, since that period, been made to

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introduce steel cables, iron still completely holds its own, nor do there appear, at present, any signs of speedy change.

The hempen cable of former times survived in the Royal Navy as a reserve cable, not as one actually used, till about 1860, and in Lloyd's Rules for the building and equipment of wooden ships, there is still an indication of the old state of things in a section which provides that:—"In all cases where hempen cables are used, one-sixth more in length will be required." One other relic of the hempen cable is seen in the survival of the term "cable's length," which has nothing whatever to do with the length of the ship's cable or any portion of it in modern times, but doubtless originated in the fact that it was about the length of the cable in earlier times. The "cable's length," as all seamen know, is nearly the tenth part of a nautical mile, that is, 607·56 ft., or 100 fathoms.

Mr. Traill, to whose valuable work on *Chain Cables and Chains*, anyone who writes on the subject must be much indebted, for the simple reason that much valuable information is given there which can be obtained nowhere else, tells us that the earliest chain cable of which we have certain knowledge as being made in England, was used in 1808, in a vessel called the *Ann and Isabella*, of 221 tons, built at Berwick-on-Tweed. It is probable that they had been used at earlier dates on the continent, for Admiral Smyth * states that, in 1818, he saw upwards of 80 sail of vessels with them at Desenzano, on the Lago di Garda. Attempts had been made to introduce chain cables at much earlier periods than that referred to. Thus, in 1634, a patent for the purpose was obtained by Philip White, a blacksmith, this being the first published patent of which there is any record. In 1780, George Matthews, of Broseley, Shropshire, took out a patent for rendering various cast-iron articles as malleable and tough as if they were made of wrought-iron, and one object of this was the manufacture of anchors and chains; and, in 1791, Colin Mackenzie patented an invention for making chains for mooring ships of a combination of iron or steel links, with intermediate links made of hemp or leather. In 1804, John Slater, a surgeon, of Huddersfield, patented a proposal for the use of iron in place of hemp in

* *Sailors' Word Book*, by Admiral Smyth.

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the manufacture of cables, but does not appear to have made any practical use of his patent, and when the first cables were actually made by Robert Flinn, at North Shields, they were not made the subject of any patent. It may have been that Flinn's cables would not have made their way into use against the strong prejudices which, in old times, always operated against anything new, but for a lucky incident. During the first year of the *Ann and Isabella's* career, she was lying in the Tyne, when there was a great flood accompanied with much floating ice. The ice cut the hempen cables of a number of ships which, thereupon made fast to the *Ann and Isabella*, and thus her iron cable saved a whole tier of vessels as well as herself. Flinn not only made the first cables but also constructed a machine for proving them, and the firm which he founded continued the manufacture till within 12 years of the present date. Lieutenant Brown, of the Royal Navy, afterwards Sir Samuel Brown, shares with Robert Flinn the honour of the introduction of chain cables. It would appear that he invented the shifting shackle, without which the whole thing would have been much longer in finding its way into general use. He, however, made his cables with twisted links, and this form of construction was very much used for many years, from the idea that the cable could be more easily worked with them. In 1809, Brown was associated in the second notable practical success attending the use of chain cables. This was in the case of the *Penelope*, of 390 tons, which had been taken as a prize from the French, and was sold and registered in London, Samuel Brown being a part owner. She was supplied with an iron chain cable by Brown, and went on a voyage to the West Indies and back under his command. He encountered adverse weather on his return in the English Channel, and was able to state that by the use of the iron cable he arrived in the River Thames three weeks earlier than the ships which had been in company with him on entering the Channel. Instead of bearing up for a port or keeping under sail upon an ebb tide, as the other vessels did, he stood in from mid-channel on the last quarter of the flood, and dropped anchor wherever he fetched, regardless of the ground, and when he got under weigh again with the young flood, the ships that had been plying were nearly out of

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sight to the westward. After this, Brown reported to the Navy Board on the subject, and a committee of naval officers having investigated the question, two ships of the line, a frigate, and a sloop of war were experimentally supplied with cables, and in 1811 the Admiralty decided upon supplying them to ships in the Navy which were stationed in open roadsteads, and in the Thames, where the hempen cables were liable to injury from ice or passing ships. It might have been expected that chain cable having thus successfully stood severe trials, would have very quickly made its way into general use, but prejudices of various kinds prevented this for several years. One prevalent idea among seamen was that vessels would not ride so easily at anchor with chain as with hemp, on account of the latter being elastic. In this they forgot the fact that the weight of the chain itself causes it ordinarily to hang in a curve, and that when a severe pull comes, the sudden force is expended in straightening the chain, and the effect of this is more valuable in easing the ship than was the stretching of the old hemp cable.

In this connection may be mentioned an investigation made by Professor Rankine,* with a view to finding the riding scope or length of chain cable that should be payed out in order that it may lie horizontally where it is shackled to the anchor. He arrived at the following result:—

	Fathoms.									
Depth of Water ...	5	10	15	20	25	30	35	40	45	50
Scope of Chain ...	47	67	82	95	107	118	128	137	146	155

Another useful rule given by Rankine gives the space required for stowage of cable. It is as follows:—The space required for the stowage of 100 fathoms of chain cable may be computed approximately by the following rule:—Multiply the square of the diameter of the cable iron in inches by 35; the product will be the space required in cubic feet nearly.

Rankine also states the interesting fact that a hempen cable was considered to be of equal strength with a chain cable, when the girth of the hempen cable is ten times the diameter of the iron of the chain cable.

* *Shipbuilding: Theoretical and Practical*, by W. M. Rankine, p. 204.

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Samuel Brown engaged in the manufacture of chains in works at Ratcliff, and also near Waterloo Bridge, but afterwards established a factory at Millwall, and there set up a machine for proving cables, and the firm which he originated is still in existence under the title of Brown, Lenox & Co. In 1818 they started works at Pontypridd, in South Wales, which, as well as the establishment at Millwall, are still in their occupation. Brown was connected with many improvements in chain cables and their manufacture, but for many years he adhered to the twisted link form of cable.

It was not, however, many years before chain cables assumed the shape which they have retained until the present time, and which may at this point be fitly described. The common link, as it is called, is that part of the cable in which the size is measured, all the other parts being larger. In the case of large cable the pieces of bar for the common link are cut off and bent by machinery, the ends being thinned down so as to form the scarf for welding, but left so far open that the last link may be threaded on to the links already complete. After being so threaded the link is heated and welded, and, while it is still hot, the stud which is made of cast iron is put in and the link closed upon it. Large chain, it may be stated, is always welded at the side of the link. There are serious differences between well and ill-formed links. A good link is of a fair elliptical shape, having no straight part at its middle. At its ends it is also a fair curve and well open, so that the link to which it is attached bears fairly in it, and not in such a way as to cut into its substance. Mr. Traill thus states the faults in make which are common at present:—"If contracts be entered into for a lump sum, there is the more need in many cases for carefully stipulating that all is to be up to a given standard of excellence, unduly long links and badly formed, &c., being then frequently made. If a cable be contracted for by weight, some makers frequently put in badly formed studs and of too great weight which they sell along with the cable to those who do not know or who are off their guard, and the buyer gets a lot of worse than useless cast-iron for his money."

The outside length of the common link in a good cable is six

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times the diameter of the iron, the outside breadth 3·6 times. The name "enlarged link" is applied to the link next to the end link of each length of cable. The diameter of the iron of which it is made is 1·1 times the size of that in the common link. The end links have no studs, being made suitable to receive the joining shackle. They are parallel sided, and the diameter of the iron of which they are made is 1·2 times that used for the common links. The joining shackle is made with iron 1·3 times the diameter of that in the common link. Finally, the anchor shackle is made of iron whose diameter is 1·4 times that of the common link.

The Admiralty, although they had been among the first to try chain cables, were long in coming to the exclusive use of them; thus it was not till 1817 that it was decided to supply one cable and a-half to all larger class ships (corvettes and upwards), and one to smaller vessels; and in 1828, when the number of cables had been increased to three, the number of hempen cables carried was the same as formerly. In 1844, when four chain cables were supplied to all the larger vessels in the Royal Navy, the number of hempen cables was reduced to three, and in 1847 they were reduced to two. It is worthy of remark that the Admiralty were thus severely cautious in trusting to chain cables, while the unreliability of hempen cables had been long shown by the fact that it was considered necessary to carry no fewer than ten of them in a first-rate.

For some years the Admiralty had a rule by which each length of 12½ fathoms of chain cable had a *swivel* in it to prevent twisting; but it was found that when the specially convenient capstan of Messrs. Brown and Harfield came into use, the swivels were the occasion of trouble and accident by slipping on the capstan, and then the rule was altered, and Admiralty cables were required only to have two swivels, one at each end of the cable.

If the Admiralty were timid as regards trusting to chain cables in place of hemp, they displayed a wise caution in the care with which they scrutinised and tested the cables made for them, and it was the effect of this in contrast to the failure of cables used by merchant ships which ultimately led to legislation on the subject. The early makers of cables no doubt took every pains both as regards

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material and workmanship to make good iron cables which should show a manifest superiority to hemp, in order that shipowners might be induced to use them in their vessels. In 1836 it would appear that chain had established its position as the regular and ordinary cable. Up to that time, underwriters had actually charged higher premiums for insurance upon vessels which had chain in place of hempen cables, but they then ceased to do so. For some time after this, however, there was no arrangement for the systematic testing of cables for the mercantile marine. In 1834 the rules of Lloyd's Register specified the length of cables, but it was not till 1846 that the surveyors were instructed to see that all new chains supplied to classed vessels were tested and that the test applied was marked on each length. In 1853 Lloyd's took the further step of requiring that before a vessel could be classed a certificate should be produced as to the test of the chain cables. About this time, the superiority of the cables supplied to the Royal Navy was made manifest by a severe trial to which a large number of men-of-war were subjected during the Crimean war. In 1854 the fleet anchored off Balaclava were exposed to a hurricane and not one of them parted a cable. This was in marked contrast to the frequent disasters about that period caused by merchant vessels parting their cables. Lloyd's Register in 1858 issued rules for the first time as to the size of cables, but it was evident that some more stringent regulations were necessary as to testing. A Select Committee appointed in 1860 made recommendations on the subject which ultimately led to the legislation of 1864.

The Act of 1864 was entitled "An Act for Regulating the Proving and Sale of Chain Cables and Anchors;" it gave power to corporations, public bodies, or companies to erect and maintain proving establishments, and to the Board of Trade to license and inspect them, the license to be renewed annually. A proof mark was to be affixed, and it was made unlawful to sell unproved cables and anchors. An Act passed in 1871 limited the corporations empowered to test cables to certain named public bodies, it being the case that under the former Act private firms had been licensed to test cables. The Act also specified the modes of testing and the amount of the test.

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Two unimportant Acts were passed in 1872, and then in 1874 the last legislation on the subject took place. The Act of 1874 provides that no chain cable or anchor of 168 lbs. weight or upwards may be sold or purchased for the use of any British ship unless it has been tested, and makes an offence in this respect a misdemeanour. A contract for the sale of a cable implies a warranty on the part of the seller that such test has been made; and the proof of the testing and stamping rests on the seller. The Act further gives the Board of Trade power to order an enquiry into the condition of the cables and anchors of any ship detained as unseaworthy. The Board of Trade also has power to settle the tests for anchors and chains in future, provided they make such tests equal or superior to the tests required by the Act of 1871. In accordance with this, an order in Council was issued in 1874 fixing the scale of tests for chain cables, and this remains in force at present. The law prescribes that when any chain cable is brought to a tester, he shall test every fifteen fathoms length of it as follows:—

"1. He shall select and cut out a piece of three links from every such fifteen fathoms, and shall test that piece by subjecting it to the appropriate breaking strain.

"2. If the piece so selected fail to withstand such breaking strain, he shall select and cut out another piece of three links from the same fifteen fathoms, and shall test such piece in like manner.

"3. If the first or second of such pieces of any fifteen fathoms of cable withstand the breaking strain, he shall then, but not otherwise, test the remaining portion of that fifteen fathoms of cable by subjecting the same to the tensile strain mentioned.

"4. He shall not stamp a chain cable as proved which has not been subjected to the breaking and tensile strains, or has not withstood the same."

Mr. Traill, who is the Inspector of Chain Cable and Anchor Proving Establishments, tells us in his book that the following construction is put upon these provisions at present by superintendents of public proving establishments.

If, after the three links have had the *breaking strain* applied to them, any flaw, crack or fracture be observed which has been caused by the breaking strain, the piece is considered to have failed.

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When the first and second samples of three links cut from the same length of fifteen fathoms fail to withstand the breaking strain, the length of fifteen fathoms is rejected. A careful examination of the chain has to be made in addition to the strains prescribed, and if any small defect is found not sufficient to condemn the length, yet sufficient to require a new link, the new link must be put in on the premises of the proving establishment, and the tensile strain again applied to the whole length. So also a stud failing must be replaced, and the length tested again before leaving the premises. In no case must any portion of a cable leave a proving establishment to have defects made good. The official scale of tests provides in the case of stud link chain for cable from $\frac{7}{16}$ in. to $4\frac{1}{2}$ ins. in diameter. Up to a diameter of $2\frac{1}{2}$ ins., which is the largest size required by Lloyd's Rules, the tensile test is obtained by the formula:

$$\text{Test in tons} = (\text{diameter in inches})^2 \times 18 \text{ tons.}$$

Over this size the rates do not increase so fast as would be given by the formula. For the smaller chains up to $1\frac{3}{8}$ inch in diameter the breaking test is 50 per cent. in excess of the proof test, but for larger chains the breaking test is 40 per cent. in excess of the proof test. Each testing establishment has its special form of testing note or certificate, and also its special marks stamped on the chain.

At present, all but one of the proving establishments in the United Kingdom are under the control of Lloyd's, the exception being that at Sunderland, which is under the control of the River Wear Commissioners. Vessels classed at Lloyd's, when their anchors and cables have been tested at Sunderland, have the letters A. & C.P. placed against their names in the register book, if they are tested at any establishment under the control of Lloyd's committee, the letters L.A. and C.P. are used to indicate the fact in the register book. The proving establishments under Lloyd's, are so placed as to be near the chief seats of the cable and anchor manufactory. They are at Tipton, Netherton near Dudley, Low Walker on the Tyne, Chester, Cardiff, and Glasgow. A testing-house in London existed some few years ago, under the management of Lloyd's, and subsequently under the Trinity House, but it was finally closed in 1875.

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From the list of the firms given by Mr. Traill in his standard work upon chain cables, it would appear that there are no less than seven firms in Dudley and its neighbourhood engaged in cable chain making. A like number are also stated as being located at Brierly Hill, while there are three at Tipton, and one each at Stourbridge and Walsall. These may be practically considered as neighbours, and not very far from them is one firm at Saltney in Cheshire. Brown, Lenox & Co., as already noticed, have their chief manufacturing establishment at Pontypridd, in South Wales. In the north of England two firms are mentioned as being at Sunderland, and two on the Tyne, and there is one establishment at Greenock.

As regards the size and length of cables carried, the rules of Lloyd's Register are the standard of reference for the Mercantile Marine. In the early rules of about 25 years ago, the equipment as regards anchors and chains for sailing-ships was regulated by the vessel's tonnage, and in steamers they were not required to exceed in weight and strength those of a sailing-vessel of two-thirds the gross tonnage. By the rules at present in force, sailing-ships are allowed to have less length of cable than formerly, but the size according to tonnage is kept up. For steamers there has been for years past a special table, and it is needless to say that the requirements are greater than those at the time we have referred to, although steamers still carry a less weight of cable than sailing-vessels of the same size, the length required being not far different, but the diameter being about 10 per cent. less.

In wooden sailing-vessels the equipment is regulated by tonnage, in flush-decked vessels the gross tonnage under the upper deck. In vessels having spaces above the upper-deck, such as a poop, &c., the net registered tonnage regulates the equipment, except in cases where the tonnage allowed for crew-space exceeds the tonnage of the spaces on deck, when the difference between these two last is added to as a correction to the register tonnage for the equipment tonnage.

In iron and steel vessels the equipment is regulated by a numeral, which for one, two, three, or spar-decked vessels is obtained by first adding together the half-moulded breadth of the vessel, her depth from the upper part of keel to the top of the upper-

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deck beams, and the girth of her half midship section to the same height all in feet. This sum is multiplied by the length in feet.

For sailing-vessels with a poop forecastle or raised quarter-deck, the equipment numeral is obtained by increasing the above numeral one-fifteenth.

For steamers with awning-decks, or continuous shade-decks, the numeral as obtained above is increased one-eighth, and for vessels having spaces on decks, the increase is regulated by the increase for an awning-deck in proportion to the length covered.

The largest cable provided for by the last issue of Lloyd's Rules for iron and steel ships, is for a vessel with an equipment numeral of 63,000 to 70,000, corresponding to a gross tonnage of 6,500 to 7,000. Such a ship is required to have 330 fathoms of cable of 2¼ ins. diameter and also 120 fathoms of stream chain of $1\frac{5}{8}$ in. diameter. Steel wire rope of 5¼ ins. circumference may be substituted for the latter.

It will be thus seen that Lloyd's Register regulates the sizes and lengths of cable carried in vessels classed in their book, and thus supplies the standard, which is, or should be, generally conformed to by merchant vessels. Further, we have seen that legislation on the subject secures that every chain used in a British ship shall have passed certain prescribed tests as to strength. Much is thus provided for, but not all. Even of cables which have passed all tests, it may be said that there are chains and chains. The two things to be taken into account which are not altogether prevented by the strictest tests are inferior material and inferior make.

The best iron for the manufacture of chain cables is not necessarily the strongest, but that which possesses good welding qualities, and which will stretch most before breaking. Some chain makers advocate different mixtures of pig iron for puddling to obtain the iron from which the best cables can be made, others advocate the use of iron made from scrap. One thing however is certain, and that is, that bar iron made from scrap iron or puddled bar mixed with crop ends of steel rails or plates should never be used for chain making, for although the tensile strength of the bar may be satisfactory, the iron will not be tough and fibrous, as the different materials of which it is composed require different working

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temperatures, and so a homogeneous bar is not produced. This latter condition of homogeneity is in the opinion of authorities, the most important point.

The Admiralty have just the same tensile and equally severe breaking tests to those which we have described as being prescribed by authority for merchant vessels; but to secure good cables they consider it necessary to have a staff of practical overseers at the works where the cable is made, and they test the iron bars before they are used in the manufacture, as follows:—A sample is taken from every batch of fifty or less bars to ascertain the ductility, &c., of the iron, and if the test is not found satisfactory, the lot is rejected. The sample is required to stand an ultimate tensile strain 22½ tons per square in. for sizes below 2½ ins. diameter, and 22 tons for sizes above, with an elongation before fracture of 20 per cent. in a length of 8 ins., for all sizes.

All bars of 1 in. diameter and above have to bend cold to the same radius as the end of the link for which they are intended, and bars of smaller size are bent still further. A hot forge test is also used; bars are punched hot with a punch one-third the diameter of the bar, at one and a-half diameter from the end. The hole is then enlarged by a drift to 1¼ diameter, the side then split off, and the ends thus set free are bent back; the whole to be done without fracture if the iron is to be considered satisfactory.

We have gone into these details in order to show what the Admiralty require in addition to the mere Act of Parliament testing of cables. Their overseers also insist upon the links, shackles, &c., being well formed, and of the proper dimensions in every direction.

Although wrought iron is the only material at present used in the manufacture of cables, attempts have been made on several occasions during the time that steel has been in use so extensively for other purposes to introduce it in the manufacture of cables. In 1879 Messrs. Brown, Bayley & Dixon, a well-known steel firm of Sheffield, submitted a "weldless" steel cable to the Admiralty for test in one of H.M. dockyards. This cable consisted of links something like an ordinary chain shackle, but with the eyes brought together and much elongated, the iron forming the eyes being of

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half round section. The cable was thus put together :—The first shackle link was closed, the eyes being brought together. Through the eye was threaded the second shackle link, which after being threaded was in its turn closed by the eyes being brought together, and so on until the length of chain was thus threaded up, there obviously being no welding necessary. This cable failed through the shape of the link which straightened and elongated under test, but had it succeeded in passing the test there were other seriously objectionable features in it. Thus, had one of the middle links of a length of chain broken, one half of the chain would require to be taken to pieces link by link in order that a new link might be put in, and the others all threaded together again, since a new one could not be welded in. This specimen piece of mild steel chain was $1\frac{3}{8}$th in. diameter.

An attempt was made in France a few years ago to make a mild steel studless chain by first rolling a bar in sectional form resembling a cross. The length of each pair of arms of the cross was the length of a link the thickness of the chain. This bar was cut and drilled in such a manner that the parts left dropped into an ordinary chain, which was consequently weldless. This process, however, involved so much labour in drilling and cutting, and so much loss of metal in reducing the solid bars to links that there was no chance of making it economical.

A method of casting chain cables of steel was described in a paper read before the Iron and Steel Institute at London in 1886, by Mr. Ferdinand Gautier, of Paris. He described the method by which MM. Joubert & Leger, of Lyons, have cast large steel chains, the two important points of their process being the use of the chilled casting system combined with instantaneous removal from the moulds. By the chilled casting system is meant casting the metal in an iron mould, which each time that it is used needs merely to be cleaned and scrubbed with graphite. It is believed that this is the best method to secure the retention unaltered of the structure of the steel without blow-holes. It is said to be always easy to secure a solid soft steel, if silicon and manganese are used in suitable proportions, but the castings are liable to blow-holes if sand moulds are used. This difficulty is due to the

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action of the metal on the moulds, in which gases are occluded that are unable to escape before solidification takes place. It may be mentioned that the chilled mould system is used in casting steel guns by the Swedish Government. Instantaneous removal from the moulds is another point of importance which it is absolutely necessary to attend to in producing chains with a metal having so high a shrinkage as steel. This is the only method whereby the links can become free to contract, and by which cracks can be got rid of.

In carrying out MM. Joubert & Leger's system, a link, having been previously cast, is kept in a vertical position through an iron casting block, which is in two pieces, one of them lying upon the other in a horizontal position. At the end of this block there is a casting hole used as a head to feed the casting. By a mechanical arrangement the casting is quickly liberated from the mould so as to cool and shrink. In practice several casting blocks were placed on a turn-table, in order that several pieces of chain might be in hand together, each cast adding a link. After the opening of the moulds a workman cut off the head of the link and filed the cut, and then the chain, when completed, was hardened and annealed in oil, after which it was ready to be tested.

M. Gautier, in his paper, remarks, in conclusion :—" It appears superfluous to describe the advantages of a process at once so simple and so quickly performed as that which I have just referred to. The process is one which opens up a new field for the successful employment of the highest qualities of steel—such steel as can be trusted to remain solid, and without blow-holes when cast in chilled moulds. Crucible steel generally would be suited to this purpose, and probably also the Mitis metal, the high manganese steel and chrome steel. If by this process better chains can be manufactured with a diminished weight of metal, it would manifestly be an important departure, and especially for naval purposes."

In the discussion which followed, Mr. J. W. Spencer, of Newburn Steel Works, Newcastle, said that a patent had been taken out for a similar process some four years ago, and he had cast several chains on this system. From the first the small chain

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was comparatively easy to cast, the great difficulty encountered being the contraction in cooling, and this difficulty was more felt with the longer links. The chains made at his works had been constructed of very mild steel of about 28 tons tension; but he thought a metal of a tensile strength as high as 34 might be used with advantage. Other speakers referred to steel chainmaking, mostly of small chains; one to some shown in the Exhibition of 1867, made under a patent; but the manufacture of which was abandoned on account of the expense.

Mr. Fox, a chain maker, of Millwall, who was present, stated that he had cast steel chains five-eighths of an inch in diameter, which had broken at 11 tons. This is about the same as is commonly found in practice in very good iron cables of the same size.

It may be mentioned also, in this connection, that at the Inventions Exhibition of 1885, there was shown a chain cable cast of Delta metal, which was said to be for a Brazilian ironclad.

No device for casting chains, however, or making them in any other way from steel has been so far successful, up to the present, as to have been practically adopted by any vessel classed in Lloyd's, or by any ship in H.M. Navy. Cast-steel anchors, however, have come into use during the last few years, and it has been necessary to consider the question of a special set of tests for them. This was done in 1887 by a Joint Committee, appointed by the Board of Trade, the Admiralty, and Lloyd's, and their report was given by us in these pages.* It may be that as more is known of the properties of steel, and of its alloys, a means may be found of casting chains with such uniformity of result that they will stand the severe tests, and meet the large requirements necessary in the case of chain cables. What has recently been stated of nickel-steel would appear to indicate that in that, or in some other similar alloy, may ultimately be found a metal from which may be cast chains of much greater strength than those at present in use.

It may be mentioned in this connection that in one vessel in the Royal Navy, a few years ago, the experiment was tried of using steel-wire rope instead of chain. Specially constructed compressors

* *Nautical Magazine*, 1888, page 828.

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and stoppers were, of course, necessary, but the plan failed as one would expect it to do, in consequence of the wires on the outside of the rope wearing through in places, and then the cable stripped in passing through the compressors. The plan was only tried through one commission of the ship, and after which the special fittings were taken out and ordinary chain cable reverted to.

CORRESPONDENCE.

FLASHING NIGHT SIGNALS.

To the Editor of the "Nautical Magazine."

SIR,—I notice in the current number of the *Nautical Magazine* a letter from Mr. Jones, of Liverpool, recommending a system of Flashing Night Signals using the long and short flash. It may interest him to be reminded that the system has been in use in most of the navies of the world for the last quarter of a century, and that the lantern he describes for using it has been on sale at Messrs. W. Nunn's, of 204, St. George Street, E., ever since the year 1862, being, in fact, in use in H.M. Army and Navy.

Your obedient servant,

April 5th. C.

SOUTH-EAST COAST OF SOUTH AFRICA.

To the Editor of the "Nautical Magazine."

SIR,—I am a subscriber to your interesting paper. Therefore allow me to correct a mistake you have made. In your February number of this year, p. 180 ("Missing East Indiamen"), your description of our coast is scarcely correct. Ships do come ashore between this and the Cape, but they do not lay many minutes anywhere without aid and all the continent knowing it by telegraph. Steam-boats pass up and down almost every day. Crews are picked up before they can land in their boats. Our prevailing winds allow ships to stand off, but they come ashore in fine weather, all sail set from the East.

Yours faithfully, ALEX. ANDERSON.

Durban, Port Natal, 15th March, 1890.

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YACHTING.

To the Editor of the "Nautical Magazine."

DEAR SIR,—Can you inform me of any periodicals on yachting worth taking. I would be obliged to know of any, and would send for them. Yours, &c., ALEX. ANDERSON.

Durban, Port Natal, 15th March, 1890.

[The following are the best periodicals on yachting matters :—*The Field*, London ; *Le Yacht*, Paris ; *Forest and Stream*, New York.—ED. *N.M.*]

BOOKS RECEIVED.

Boilers, Marine and Land; their Construction and Strength. A Hand-book of Rules, Formulæ, Tables, &c., for the use of Engineers, Surveyors, Draughtsmen, Boiler-Makers and Steam-users. By T. W. Traill, F.E.R.N., Member of the Institution of Civil Engineers ; Engineer Surveyor-in-Chief to the Board of Trade, &c. London : C. Griffin & Co. 1890. Second edition.

WE recently, in reviewing the first edition of this work, spoke of its great value to all who have to do with the designing and use of boilers, giving as it does not only a complete *resumé* of the rules of boiler construction, rivetting, pressures, &c., but a large amount of tabular matter which will save much computation, and enable the boiler designer to obtain results with as little labour as possible, and also with great accuracy and despatch. In the second edition now before us, tables have been added for pressures up to 200 lbs. per square inch, so as to be well up with the requirements of the time. New tables and other matter have also been introduced. The volume before us is put up in such a form as to serve as a pocket book, while at the same time it is a complete practical manual on the whole subject of boiler construction.

Catechism of the Laws of Storms : also Odds and Ends connected with Modern Seamanship. By John Macnab, Lieut. R.N.R. New and Enlarged Edition. London : George Philip and Son.

THIS little work on an all-important subject for those that "go down to the sea in ships" has been carefully prepared for the

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general use of sea officers, and also contains instructions for answering papers on the law of storms in the Board of Trade examination. From a general perusal of the book we can commend it, inasmuch as it is not a bald exemplification of the nature of storms, got up to *cram* a candidate; but contains much information on meteorology of great value to a seaman. Not the least valuable part of the work are the "odds and ends connected with modern seamanship;" these are of the utmost importance to a young sea officer, and are not explained in most other works.

Weather and Tidal Forecasts for 1890. By D. Dewar. Glasgow: James Brown & Son.

Our readers were very familiar with the author at the time he was developing his "new theory of nature," but we have reason to believe that he made few converts to his views. The forecasts "are mainly based upon the simple idea that the prevailing westerly movement of the air in the two great belts in the north and south temperate zones is due to the continued westerly (west to east) movement of the sun and moon;" and the probable weather, as given in the work before us, "is stated to be chiefly applicable to the British isles and neighbourhood." But comparing the weather predicted for January and March with what actually occurred, we cannot say it was even approximately correct. The general predictions were for "cold," whereas, excepting a few days, the actual weather was remarkably mild during those two months.

Barometerstanden en Winden in de Golf van Aden en den Indischen Oceaan bij Kaap Guardafui. Utrecht.

This is one of the publications of the Netherlands Royal Meteorological Institution. It relates to the barometer and winds (direction and force) of the Gulf of Aden and that part of the Indian Ocean adjacent to Cape Guardafui, and thus the *twelve* monthly charts range from lat. 5° to 13° 36′ N., and from long. 43° to 58° E. Besides the general introduction and elucidation by P. F. van Heerdt, Director of Charts, there is a special explanation for each chart, detailing the basis of the method of arranging the various phenomena. The systematic production of charts of this description is always of considerable value to seamen navigating dangerous localities.

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TIDE TABLES FOR MAY, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	London Bridge.		Hull.		North Shields.		Leith.		Devonport.		Dover.		Weston-super-Mare.		Liverpool.		Greenock.		Queenstown.		Kingstown.		Londonderry.		Brest.	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
Th	1	11 47	—	4 0	4 23	1 2	1 24	—	0 18	2 55	3 24	8 35	8 57	4 5	4 32	8 57	9 18	9 33	9 55	8 24	2 47	8 45	9 8	5 39	5 58	1 36	1 42
F	2	0 12	0 34	4 44	5 3	1 44	2 2	0 38	0 57	3 48	4 10	9 18	9 38	4 56	5 18	9 37	9 54	10 15	10 35	8 9	8 29	9 29	9 48	6 16	6 34	2 1	2 19
S	3	0 52	1 11	5 20	5 37	2 19	2 36	1 15	1 32	4 30	4 50	9 57	10 16	5 39	6 0	10 11	10 28	10 54	11 13	8 48	4 7	10 6	10 23	6 52	7 10	2 36	2 54
Su	4	1 29	1 47	5 55	6 14	2 52	3 9	1 49	2 7	5 10	5 29	10 36	10 57	6 20	6 40	10 47	11 6	11 38	11 53	4 26	4 46	10 40	10 57	7 28	7 46	3 12	3 30
M	5	2 5	2 21	6 33	6 52	3 27	3 45	2 25	2 43	5 48	6 7	11 18	11 39	7 0	7 20	11 25	11 44	—	0 13	5 6	5 26	11 14	11 32	8 4	8 22	3 49	4 8
Tu	6	2 39	2 59	7 12	7 32	4 4	4 24	3 1	3 20	6 26	6 45	—	noon	7 39	7 58	—	0 4	0 33	0 53	5 46	6 6	11 52	—	8 40	8 59	4 27	4 47
W	7	3 18	3 38	7 52	8 12	4 44	5 4	3 39	3 59	7 3	7 22	0 21	0 43	8 17	8 37	0 24	0 44	1 13	1 33	6 26	6 46	0 12	0 33	9 18	9 38	5 7	5 28
Th	8	3 59	4 19	8 32	8 54	5 26	5 49	4 21	4 44	7 42	8 4	1 6	1 29	8 57	9 18	1 5	1 27	1 54	2 15	7 8	7 31	0 55	1 18	9 59	10 21	5 49	6 12
F	9	4 42	5 5	9 18	9 43	6 13	6 39	5 8	5 34	8 26	8 48	1 53	2 18	9 40	10 2	1 49	2 13	2 38	3 2	7 55	8 20	1 42	2 8	10 47	11 18	6 37	7 4
S	10	5 29	5 55	10 10	10 42	7 7	7 39	6 4	6 36	9 11	9 36	2 45	3 14	10 25	10 52	2 39	3 7	3 28	3 56	8 47	9 17	2 37	3 8	11 56	—	7 34	8 7
Su	11	6 25	6 56	11 19	mid.	8 17	8 58	7 11	7 51	10 6	10 41	3 45	4 17	11 28	11 58	3 39	4 17	4 28	5 3	9 49	10 24	3 42	4 21	0 40	1 28	8 42	9 19
M	12	7 30	8 9	—	0 42	9 40	10 22	8 33	9 16	11 20	—	4 50	5 24	—	0 37	4 57	5 40	5 40	6 18	11 3	11 43	5 2	5 41	2 17	3 0	9 59	10 41
Tu	13	8 52	9 35	1 21	1 58	11 2	11 38	9 56	10 31	0 4	0 50	6 0	6 36	1 17	1 55	6 24	7 4	6 57	7 34	—	0 20	6 18	6 52	3 37	4 8	11 21	11 58
W	14	10 14	10 49	2 32	3 4	—	0 10	11 3	11 32	1 32	2 10	7 11	7 43	2 32	3 8	7 39	8 10	8 10	8 42	0 56	1 31	7 24	7 55	4 34	4 57	—	0 30
Th	15	11 22	11 51	3 34	4 2	0 38	1 3	11 58	—	2 43	3 13	8 13	8 41	3 42	4 14	8 37	9 2	9 12	9 39	2 2	2 31	8 24	8 52	5 20	5 43	0 59	1 25
F	16	—	0 17	4 28	4 51	1 27	1 50	0 22	0 45	3 39	4 4	9 7	9 30	4 43	5 10	9 25	9 46	10 4	10 27	2 57	3 21	9 17	9 40	6 4	6 26	1 49	2 11
S	17	0 40	1 3	5 13	5 35	2 11	2 31	1 6	1 27	4 27	4 49	9 52	10 14	5 34	5 57	10 6	10 26	11 49	11 11	3 48	4 5	10 0	10 19	6 48	7 9	2 31	2 51
Su	18	1 24	1 45	5 55	6 15	2 50	3 9	1 47	2 7	5 10	5 29	10 36	10 58	6 19	6 40	10 46	11 6	11 33	11 54	4 26	4 46	10 38	10 56	7 30	7 50	3 11	3 31
M	19	2 4	2 22	6 35	6 54	3 28	3 47	2 26	2 44	5 48	6 6	11 19	11 39	7 0	7 20	11 26	11 45	—	0 14	5 6	5 26	11 14	11 32	8 8	8 24	3 51	4 10
Tu	20	2 41	2 59	7 13	7 32	4 5	4 23	3 1	3 18	6 24	6 41	11 59	—	7 38	7 55	—	0 8	0 33	0 52	5 45	6 3	11 50	—	8 40	8 56	4 28	4 45
W	21	3 18	3 35	7 50	8 7	4 41	4 59	3 36	3 54	6 56	7 11	0 18	0 37	8 12	8 29	0 21	0 39	1 10	1 28	6 21	6 39	0 8	0 27	9 13	9 30	5 2	5 19
Th	22	3 54	4 12	8 24	8 42	5 18	5 37	4 12	4 31	7 27	7 43	0 57	1 17	8 46	9 3	0 57	1 15	1 46	2 4	6 57	7 16	0 46	1 5	9 47	10 4	5 37	5 56
F	23	4 30	4 47	9 1	9 21	5 57	6 17	4 50	5 10	7 59	8 15	1 37	1 57	9 20	9 37	1 33	1 52	2 22	2 41	7 35	7 54	1 25	1 45	10 23	10 44	6 15	6 35
S	24	5 4	5 24	9 41	10 1	6 37	6 59	5 32	5 55	8 31	8 47	2 17	2 38	9 54	10 12	2 11	2 31	3 0	3 20	8 18	8 33	2 6	2 28	11 9	11 30	6 56	7 18
Su	25	5 45	6 8	10 25	10 52	7 23	7 50	6 19	6 45	9 6	9 28	3 0	3 22	10 31	10 52	2 53	3 16	3 42	4 5	8 54	9 17	2 52	3 17	—	0 11	7 42	8 8
M	26	6 32	6 59	11 22	11 55	8 19	8 52	7 14	7 46	9 54	10 25	3 45	4 10	11 17	11 46	3 42	4 11	4 29	4 56	9 43	10 10	3 45	4 16	0 45	1 22	8 36	9 6
Tu	27	7 27	7 58	—	0 29	9 27	10 3	8 19	8 55	10 58	11 34	4 37	5 7	—	0 18	4 43	5 19	5 25	5 57	10 43	10 18	4 49	5 22	2 2	2 40	9 39	10 15
W	28	8 32	9 10	1 2	1 35	10 38	11 11	9 32	10 5	—	0 12	5 37	6 8	0 52	1 26	5 58	6 35	6 32	7 7	11 52	—	5 55	6 26	3 15	3 45	10 51	11 25
Th	29	9 47	10 19	2 6	2 36	10 41	—	10 34	11 1	0 51	1 29	6 39	7 9	1 59	2 31	7 8	7 37	7 39	8 9	0 25	0 56	6 55	7 23	4 11	4 34	11 57	—
F	30	10 50	11 18	3 4	3 30	0 9	0 34	11 26	11 50	2 4	2 34	7 38	8 5	3 2	3 32	8 4	8 29	8 37	9 3	1 25	1 53	7 50	8 16	4 55	5 15	0 25	0 51
S	31	11 45	—	3 55	4 18	0 57	1 18	—	0 13	3 2	3 27	8 30	8 53	4 1	4 28	8 51	9 12	9 28	9 51	2 19	2 43	8 40	9 4	5 34	5 53	1 14	1 36

TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* — *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−3 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 13	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+3 3	Brest
Boulogne	+0 13	Dover
Bridport	+0 24	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadiz	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 57	Dover
Campbellton	−0 28	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bar	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 37	Londonderry
Coquet Road	−0 28	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 56	Dover
Exmouth	+0 38	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 12	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 53	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 53	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 3	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 48	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 13	Devonport
Peterhead	−1 43	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 38	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 23	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 8	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 22	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+3 20	Queenstown
Whitby	+0 22	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 48	London
Youghall	+0 18	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt. = Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
193	England—River Medway—Pinup and Gillingham Reaches	Permanent buoys.
194	,, Thames Entrance—Duke of Edinburgh Channel	Changes in buoyage.
195	,, East Coast—Galloper Light	Intended alterations.
196	,, ,, Yarmouth Buoyage—Pakefield Gat	Buoy with globe and half globe.
197	,, ,, North Haisborough—Light-Vessel	Intended alterations.
198	,, West Coast—Menai Strait—W. Approach	Sandbanks altered.
199	,, ,, River Dee—Hoyle Spit, &c., &c.	Buoys altered in position.
200	Scotland—West Coast—Raasay Sound—Jackal Rock	New buoy.
201	North Sea—River Schelde—Zierikzee—Val	Sector of green.
202	,, Texal Approach—Haaks	New light-vessel and fog-signal.
203	,, Netherlands—Texel—Schulpen Gat	Torpedo ground.
204	,, Germany—Ems River Entrance—Pilsum	Experimental light.
205	Baltic—Bornholm—Hammer Point	Light altered.
206	,, ,, Due Odde	Fog-signal altered.
207	,, Christiansö	New fog signal.
208	,, Gulf of Bothnia—Sweden—Ratan and Rataskär	Alteration in lights.
209	France—North Coast—Trouville	Additional signals.
210	Spain—West Coast—Arosa Bay—Villagarcia	Provisional light on mole.
211	Mediterranean—Sardinia—Cape Figari	Semaphore Station.
212	,, ,, Gulf of Tortoli—Arbatax	Mole damaged—light and beacon.
213	,, Sicily—Port Milazzo	Light altered at mole.
214	,, ,, Gozzo Spadaro	Arc of visibility of light.
215	,, Bay of Tunis—Goletta	Mole and harbour lights.
216	,, Grecian Arch.—Zeitoun (Stylida) Gulf—Cape Kiliomeli	New light.
217	,, Grecian Arch.—Mitylenì—Sigri Is.	Re-exhibition of permanent light.
218	,, ,, Imbros—Cape Kephalo	New lights.

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Monthly Abstract of Nautical Notices—*Continued.*

No.	Place.	Subject.
219	Mediterranean—Egypt—Port of Alexandria	Dredging operations; cautions.
220	„ Syria—Beirút	Harbour works in progress.
221	Red Sea—Zebayir Is.	Dangerous shoal to S.E.
222	Africa—West Cst.—N. of Cape Frio	Reported shoal.
223	„ S.E. Cst.—Algoa Bay—Cape Recife	Visibility of light.
224	„ East Coast—Innambán River	Buoyage and beacons.
225	„ „ Zambesi River—River Chinde	Information and sailing directions.
226	„ „ Cape Melinda	Shoal to S.E.
227	India—West Coast—Alibág	New harbour light.
228	„ „ Vingorla Rocks (Burnt Is.)	Alteration in light.
229	Ceylon—Point de Galle	Light altered in character.
230	Bay of Bengal—Arakan River—Savage Is.	Provisional light exhibited.
231	„ British Burma—Pegu—Alguada Reef	Depths on S. part.
232	„ „ Martaban Gulf—Moulmein River	Entrance channels altered.
233	China Sea—Malay Penin.—E. Coast—Pahang and Kuantan Rivers	New harbour lights.
234	Celébes Sea—Talautse Is.—Sangir Is.—Manganitu Bay	Reported reef in approach.
235	Japan — Nipon — Tokio (Yedo) Gulf—Yokohama	Light-vessels marking break-waters.
236	Australia—E. Coast—Gt. Sandy Strait	Additional lights.
237	„ „ Moreton Bay—Howe or North Chan.	Alteration in lights.
238	„ S. Coast—Portland Bay	Particulars of harbour lights.
239	North America—U.S. Pacific Coast—California—San Francisco Harb.—Oakland Harb.	Fog-signal altered.
240	„ U.S. Pacific Coast—California—Año Nuevo Is.	New light fronting fog-signal.
241	South America—Chile — Pantagonian Channels—Smyth Channel—Shoal Is.	Particulars of beacon.
242	„ Patagonian Channels—English Narrows—Eve Point	Particulars of shoal to N.E.
243	„ East Coast—River Amazons—West Branch—Balique Is.	New light.
244	United States—Delaware River—Reedy Is.	Sector of white light.
245	„ Rhode Is.—Narragansett Bay—Castle Hill	New light and fog-signal.
246	Nova Scotia — Pubnico Harb. — Beach Point	Range of visibility of light.
247	Prince Edward Island—Charlottetown Harb.—Blockhouse Point	Red sector discontinued.
248	Gulf of St. Lawrence—Magdalen Is.—Grindstone Island	Fog-signal discontinued.
249	River St. Lawrence—Red Islet	Light to be altered in character.
250	„ Isle St. Thérèse	Particulars of lights on N.E. part.

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NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

193.—ENGLAND.—*East Coast.—River Medway.—Permanent Buoys Between Pinup and Gillingham Reaches.*—Referring to Notice 94, p. 241, on temporary alterations in the buoyage between Pinup and Gillingham reaches, for dredging purposes; by further notice, dredging in the locality having been completed, the temporary buoys have been withdrawn, and two permanent buoys placed as follows, the channel now being 300 feet in width:—(1.) *Lower Pinup* buoy, *conical* red, is moored in 17 feet, with Folly point beacon bearing W. by N. $\frac{3}{8}$ N., distant $2\frac{1}{8}$ cables. (2.) *Upper Pinup* buoy, *conical* red, is moored in 17 feet, with Folly point beacon bearing N.W. $\frac{5}{8}$ W., distant $2\frac{1}{10}$ cables. The depths given are at L.W. ordinary spring tides. *Variation*, 17° *W.*

194.—ENGLAND.—*Thames Entrances.—Duke of Edinburgh Channel.—Buoyage Changes.*—The following buoyage changes have recently been made:—

(1.) The *Shingles Patch Buoy, No.* 1, has been moved $1\frac{1}{4}$ cable East nly. of its charted position (December, 1889), and now lies in $5\frac{1}{2}$ fathoms, L.W. spring tides, with the following marks and bearings, viz.:—Thanet Mill, in line with Margate Old Church, South; Monkton beacon, in line with the West end of the Westernmost block of houses on Cliff End point, S.S.W.; Edinburgh channel light-vessel, N.E. $\frac{3}{4}$ N. (distant $\frac{5}{10}$ths of a mile); East Shingles buoy, S. $\frac{1}{2}$ E. ely. (distant $1\frac{4}{10}$ths mile); Shingles Patch buoy, No. 2, N.W. $\frac{1}{4}$ N. (distant $\frac{6}{10}$ths of a mile.)

(2.) The *Shingles Patch Buoy, No.* 3, has been moved $1\frac{1}{4}$ cable E.S.E. of its charted position (December, 1889), on to the Northern projection of the patch, and now lies in 5 fathoms, L.W. spring tides, with the following marks and bearings, viz:—The Westernmost of two mills at East Margate, in line with the chancel end of Trinity church, bearing S. $\frac{1}{2}$ E.; Chislet Mill, in line with the East end of a row of cottages at Reculvers Village, S.W. $\frac{1}{4}$ S.; North-East Shingles buoy, N.W. by W. wly. (distant $1\frac{3}{10}$ths mile); Edinburgh channel light-vessel, E. by S. $\frac{1}{4}$ S. (distant 1 mile);

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No. 2 Shingles Patch buoy, S.E. ¾ E. ely. (distant $\frac{4}{10}$ths of a mile.)

(3.) The *Knock John (Gas) Buoy* has been moved to a position half a cable to the Northward of a line between the East Knob buoy, and the Black Deep light-vessel, and about midway between them; it now lies in 9 fathoms, L.W. spring tides, with the following marks and bearings, viz:—Reculvers in line with the new Girdler beacon, S. by W. wly.; North Foreland light-house, half its height open East of the North Margate beacon, S.S.E. ¼ E.; Black Deep light-vessel, E. ½ N. nly. (distant 2 miles); East Girdler beacon, S. by E. ¼ E. (distant 1 mile); East Knob buoy, W. ¾ S. sly. (distant $1\frac{5}{10}$ths mile.)

(4.) The *East Knock John Buoy* has now been discontinued.

195.—ENGLAND.—*East Coast.—Intended Alteration in Character and Position of the Galloper Light.*—Early in the ensuing Autumn, it is intended to change the character of the Galloper light from two fixed white lights, on separate masts, as at present, to *one light* showing *two red flashes* in quick succession *every forty-five seconds*. Also, coincidently with the change of character, the light-vessel will be moved about three quarters of a-mile S. ¼ E. to a position off the S.W. end of the shoal. Further notice will be given.

196.—ENGLAND.—*East Coast.—Yarmouth Buoyage.—Pakefield Gat Buoy.*—It is intended shortly to surmount the Pakefield Gat buoy with a globe and a half globe, instead of the present globe, in order to distinguish it from the East Holm buoy.

197.—ENGLAND.—*East Coast.—Intended Alteration in Character of the Light and Fog-Signal of the North Haisborough Light-Vessel.*—Early in the ensuing Autumn, it is intended to change the character of the North Haisborough light from two fixed white lights, on separate masts, as at present, to one light showing *four white flashes* in quick succession *every thirty seconds*. Also, a fog-horn will at the same time be placed on board this vessel, which will sound in thick or foggy weather *two blasts* (high low) in quick succession *every two minutes*. Further notice will be given.

198.—ENGLAND.—*West Coast.—Menai Strait.—Alterations in the Western Approach.*—As the sand banks in the Western approach

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to Menai strait have completely altered since the survey was made in 1872, no reliance whatever can be placed on that portion of the plan, No. 1,464 (Admiralty Chart). The buoys are altered in position to meet the changes in the channel.

199.—ENGLAND.—*West Coast.—River Dee Buoyage.—Alteration in Position of the Hoyle Spit Buoy, &c., &c.*—(1.) The Hoyle Spit having extended to the westward, the Hoyle Spit buoy has been moved two cables N.W. of its former position, and now lies in eleven feet at L.W. spring tides, with the following marks and bearings:—Brynllystin house, open to the westward of Talacre Lifeboat-house, S.S.E. ¼ E.; The tallest chimney at Prestatyn lead works in line with a conspicuous hill on the back high land, S.S.W.; Air Point light-house, in line with the South Brow of Heswell hill, S.E. ¾ E.; S.E. Middle Patch buoy, W. by S. ¼ S. (distant $\frac{3}{10}$ths of a mile); South Hoyle buoy, S.E. by E. ¼ E. (distant $1\frac{1}{10}$th mile).

(2.) Also, considerable changes having taken place in the upper part of the Dee channel, the positions of the following buoys have been shifted in conformity therewith:—Flint; Elbow; Bug, No. 3; Bug, No. 2; Bug, No. 1.

200.—SCOTLAND.—*West Coast.—Jackal Rock, Sound of Raasay.*—A *port-hand* buoy has been placed to guard a sunken rock on the S.W. side of Churchtown bay, in the Sound of Raasay, known as the "Jackal Rock." The buoy is can in shape, coloured black, and is moored west of the rock, in 4 fathoms at L.W. spring tides. The marks and bearings from the buoy are as follows:—Chimneys of Suishnish cottage just seen north of Suishnish brow, bearing E. ½ N.; Carngarave point at H.W. mark touching the land south of Portree entrance at H.W. mark, bearing N.; steeple of Raasay farm square in line with south end of gamekeeper's house, bearing N.N.E. ¾ E.; Ollach rock open about a sail's breadth off Old Castle point, bearing N.W. ¼ N.

201.—NORTH SEA.—*Netherlands.—River Schelde.—Zierikzee.—Val Lighthouse.—Sector of Green Light.*—A sector of *green* light (the eastern limit of which indicates the position of the red buoy marking the N.W. edge of Dortsman spit) is now shown between the bearings of North and N. by W. ¼ W. from Val lighthouse,

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eastward of Zierikzee Niewe haven. Val light, fixed, now shows *red* from the bearing of E.S.E. through east, to N.E. ¾ N.; *white* from N.E. ¾ N. to North; *green* from North to N. by W. ¼ W.; and again *white* from N. by W. ¼ W. to W.N.W. Position, lat. 51° 38′ N., long. 3° 55′ E. *Variation*, 15° *W.*

202.—North Sea.—*Texel Approach.—Light-Vessel, Exhibiting a Flashing White and Red Light, with Fog-Signal.*—With reference to Notice 101, p. 243, on its having been intended to place a light-vessel in the approach to the Texel, with Kykduin lighthouse bearing S. 73° E., distant 15¼ miles; on 1st March, 1890, the light-vessel *(Haaks)* was moored in a depth of 15¼ fathoms at L.W. (bottom fine white sand with fine black specks), in the approach to the Texel. Haaks light is a *flashing white* and *red* light, showing every *thirty seconds:—two white flashes* in quick succession, then an eclipse of *ten seconds*, followed by a single *red flash*. It is shown from the mainmast, elevated 36 feet above the sea (in bad weather 31 feet), and visible from a distance of 11 miles. The light-vessel, with one mast and a jigger mast, is painted red, with a broad white streak, and the word *Haaks* in black letters on her sides; and carries a red ball at the masthead as a daymark. A white riding light is shown from the fore-stay. Position, on Admiralty Chart, lat. 52° 58′ N., long. 4° 18′ E. *Variation*, 15° *W.* From this light-vessel, during thick or foggy weather, a caloric siren, will give *two blasts* in quick succession every *two minutes*. Should the siren not be ready for use, or be out of order, a bell will give *two strokes* in succession, followed by a pause every *thirty seconds*.

Note.—When from any cause the flashing light cannot be exhibited, a fixed *white* lantern light will be shown from the masthead, and a *red* flare-up every 10 minutes from above the gunwale. If this light-vessel has drifted from her station, the usual lights will not be exhibited, but a fixed *red* light will be shown from each end of the vessel. By day a red flag will be hoisted above the red ball at the masthead. Should a vessel be seen standing into danger a gun will be fired, and repeated if necessary; also the signal flags J. D. of the International Code, "You are in danger," will be hoisted and kept flying until answered. A bright rocket

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immediately after a gun will indicate that assistance from the shore is required. To mark the position of the light-vessel, two anchor-buoys, both painted red with a white horizontal stripe, and with *H. No. 1* and *H. No. 2* on them respectively, in black letters, are moored North and South, distant 8 cables from each other.

203.—North Sea.—*Netherlands.—Texel.—Torpedo Ground in Schulpen Gat*—About the middle of April, 1890, experiments will be made with charged torpedoes in Schulpen gat, Texel. The torpedoes will be laid in Schulpen gat, off Kykduin, outside the line of white buoys, and on both sides of the fairway. The torpedo ground will be marked by buoys, and as long as the charged torpedoes are in use, warning will be given by a torpedo vessel, carrying a red flag at the masthead.

204.—North Sea.—*German Coast.—River Ems Entrance.—Pilsum—Light Exhibited Experimentally.*—By notice, dated 5th April, 1890, it is intended to exhibit a light near Pilsum, east side of river Ems entrance, experimentally—but neither its regular exhibition, nor the limits of visibility, herein given, is to be relied on. Pilsum light is a *white* light, showing a *single flash* from the bearing of N. 72° E., through east, to S. 81° E.; *fixed* from S. 81° E. to S. 78° E.; a *double flash* from S. 78° E. to S. 73° E.; and obscured in all other directions. Elevated 49 feet above H.W., and visible from a distance of about 12 miles. Position, lat. 53° 29′ 55″ N., long. 7° 2′ 50″ E. *Variation*, 14° *W.* Further particulars will be published.

205.—Baltic.—*Bornholm.—North Coast.—Hammer Point.—Alteration in Character of Light.*—Referring to notice in 1889, on intended alteration of the character of Hammer point light, north coast of Bornholm; on 15th April, 1890, the following alteration would be made:—Hammer point light will be an *occulting* light, with *two occultations* in quick succession *every thirty seconds*, as follows:—Light *twenty-three seconds*, eclipse *two seconds*, light *three seconds*, eclipse *two seconds*. Position, lat. 55° 16′ 15″ N., long. 14° 45′ 45″ E.

206.—Baltic.—*Bornholm.—South Coast.—Due Odde.—Alteration in Fog-Signal.*—Referring to notice in 1889, on intended alteration in the fog-signal at Due Odde, south point of Bornholm;

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on 15th April, 1890, the following alteration would be made: The siren at Due Odde, during thick or foggy weather, will give two blasts (high, low) *every two minutes*, as follows:—High note *two seconds*, interval *three seconds*, low note *five seconds*, interval *one hundred and ten seconds*. Position, lat. 54° 59′ 30″ N., long. 15° 4′ 45″ E.

207.—Baltic.—*Christiansö.—Fog-Signal to be Established.*—Referring to notices in 1889, on the intended establishment of a fog-signal on Christiansö, north-eastward of Bornholm; on 15th April, 1890, the fog-signal would be established. The signal on Christiansö, during thick or foggy weather, will be given alternately from two powerful first-class sirens, and will be a blast of *six seconds'* duration *every minute*. One siren, situated close northward of the lighthouse, will transmit sound strongest in a N.W. direction; the other situated about 230 yards S.E. of the lighthouse, will transmit sound strongest in an E.S.E. direction. Position, lat. 55° 19′ 10″ N., long. 15° 11′ 45″ E.

208.—Baltic.—*Gulf of Bothnia.—Swedish Coast.—Ratan.—Alterations in Lights.*—Referring to notice in 1889, that one of the lights at Ratan would be removed to Rataskär, and the other would remain as a leading light for the harbour; on 15th April, 1890, the following alterations will be made:—

1. *Rataskär Light* will be a *fixed* light, showing *white* from (approximately) the bearing of S. 25° W. to S. 88° W.; *red* from S. 88° W., through west, to N. 78° W., covering Rata Störgrund; and again *white* from N. 78° W., through north to N. 30° E. Elevated 86 feet above the sea, and visible, the white light from a distance of about 13 miles, the red light from a distance of about 9 miles. Illuminating apparatus dioptric, or by lenses, of the fourth order. The lighthouse, with keeper's dwelling attached, is situated about 100 yards S.E. of the beacon on Rataskär. Position, lat. 63° 59′ 55″ N., long. 20° 54′ 30″ E. *Variation*, 5° *W.*

(2.) *Ratan.*—The fixed white light is discontinued; and in lieu of the fixed red light, a *quick flashing* leading light will be exhibited at this place. The *quick flashing* light (light *one second*, eclipse *one second*) at Ratan will show *white* in the fairway of approach from the bearing of N. 21° W. to N. 13° W.; *red* from N. 13° W. to

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about N. 5° W.; and towards the inner part of the harbour an unstrengthened *flashing white* light. Visible, the white light from a distance of 8 miles, the red light from a distance of about 5 miles.

209.—FRANCE.—*North Coast.—Trouville.—Additional Signals.*—A blue pendant during the day, and a *green* light at night, hoisted on the mast at the harbour master's office at Trouville, indicate that vessels cannot leave the port.

210.—SPAIN.—*West Coast.—Arosa Bay.—Villagarcia.—Provisional Light on Mole.*—On 15th March, 1890, a provisional light would be exhibited from the mole at Villagarcia, north-eastern shore of Arosa bay. The light on the mole at Villagarcia is a *fixed red* light, elevated 24 feet above H.W., and visible from a distance of 3 miles. The light is shown from a wooden support, painted white, and situated on the extremity of the mole, which extends 460 yards from the shore. Position, lat. 42° 35′ 55″ N., long. 8° 45′ 45″ W.

211.—MEDITERRANEAN.—*Sardinia.—N.E. Coast.—Semaphore Station on Cape Figari.*—On 11th March, 1890, a semaphore station was established on cape Figari. Position approximate, lat. 40° 59′ 45″ N., long. 9° 39′ 10″ E.

212.—MEDITERRANEAN.—*Sardinia.—East Coast.—Gulf of Tortoli.—Arbatax.—Mole Damaged, Provisional Light and Beacon.*—During a gale on the 4th March, 1890, the mole at Arbatax was damaged, and it being impossible to exhibit the usual *red* light, a provisional light is shown from the outer part of the masonry still standing. The provisional light at Arbatax is a *fixed red* light. Vessels should pass not less than about 1½ cable northward of the light. Position, lat. 39° 56½′ N., long. 9° 42′ E. Also, it is intended to erect a beacon, coloured white and black, at the extremity of the mole at Arbatax, as a day-mark.

213.—MEDITERRANEAN.—*Sicily.—North Coast.—Port Milazzo.—Light-Vessel Withdrawn, and Red Light Exhibited on Mole Extension.*—With reference to notice in 1885, on a light-vessel having been placed to mark the extension of the mole at port Milazzo, north coast of Sicily, by notice, dated 10th March, 1890, the extension of the mole is completed, the light-vessel withdrawn, and the following permanent light exhibited:—A *fixed red* light is shown

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from the extremity of the masonry of the mole at Milazzo, 44 yards within the submerged extreme, and elevated 19 feet above the sea.

214.—MEDITERRANEAN.—*Sicily.—S.E. Coast.—Cozzo Spadaro Light.—Arc of Visibility.*—Cozzo Spadaro light, *fixed* and *flashing* white, is visible through an arc of 285°, or from the bearing of S. 76° E., through west, to S. 1° E. *Variation*, 9° *W.*

215.—MEDITERRANEAN.—*Bay of Tunis.—Goletta.—Moles and Harbour-Lights.*—Information from Commander H.S.H. Prince Louis of Battenberg, G.C.B., H.M.S. *Scout*, relative to moles and harbour-lights at Goletta, bay of Tunis. The eastern mole at Goletta has been extended about one cable in a south-easterly direction. A new mole has been constructed of loose stones, the outer extreme of which, marked by a stake, bears S.W. by W. ½ W. $1\frac{4}{10}$ths cable from the outer extreme of the eastern mole; from the stake, the new mole extends in a straight line to the beach (N.W. ½ W.), a distance of about 4 cables. In addition to the fixed *red* light previously shown from the eastern mole at Goletta, a *fixed red* light, visible for a distance of 2 miles, is now exhibited from a pole, about 20 feet high, near the end of the extension of that mole; and a *fixed white* light, visible from a distance of about 2 miles, is shown from a pole, about 15 feet high, near the end of the new mole. *Variation*, 11° *W.*

216.—MEDITERRANEAN.—*Grecian Archipelago.—Gulf of Zeitoun or Stylida Entrance.—Light on Cape Kiliomeli.*—On 4th March, 1890, a light would be exhibited from a lighthouse erected on cape Kiliomeli (Andéro), south side of entrance to the gulf of Zeitoun or Stylida. It is a *fixed white* light, varied by a *red* flash of *about seven seconds'* duration, *every thirty seconds:* elevated 80 feet above H.W., and visible from a distance of 9 miles. Illuminating apparatus, dioptric, or by lenses, of the sixth order. The lighthouse, 26 feet high, constructed of iron and circular in shape, with keeper's dwelling near, is situated about 87 yards S.W. of the sandy extreme of the cape. Position, lat. 38° 51′ 5″ N., long. 22° 42′ 35″ E.

217.—MEDITERRANEAN.—*Grecian Archipelago.—Mityleni.—Sigri Island.—Re-Exhibition of Permanent Light.*—With reference

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to notice in 1889, that the illuminating apparatus of the light on Sigri island, west coast of Mityleni, had been destroyed by an earthquake, and that a provisional light would be exhibited; on 30th March, 1890, the permanent light was re-exhibited. Sigri island light will be a *flashing white* light *every thirty seconds*, elevated 180 feet above the sea, and visible from a distance of 24 miles. The eclipses are not total within the distance of 10 miles. Position, lat. 39° 13′ N., long. 25° 51′ E.

218. — MEDITERRANEAN. — *Grecian Archipelago. — Imbros. — Lights on Cape Kephalo.*—On 30th March, 1890, two lights would be exhibited on the extreme of cape Kephalo, east coast of Imbros. They will be two *fixed white* lights, placed vertically; the upper light, elevated 128 feet above the sea, should be visible from a distance of 10 miles. Position, approximate, on Admiralty Charts, lat. 40° 9′ 20″ N., long. 26° 0′ 35″ E.

219.—MEDITERRANEAN.—*Egypt.—Port of Alexandria.—Dredging Operations.*—By notice, dated 19th March, 1890, the operations in connection with the dredging of the pass (*New pass*), about half-a-mile S.W. of Boghaz or Central pass, entrance to that port, would be commenced without delay; and while the work is in progress, the following regulations are to be observed:—(1.) The dredger will hoist a square red flag while working, and when this flag is dipped, it will indicate that the pass is free and vessels can proceed. (2.) Vessels intending to enter the pass from the port during dredging operations must proceed to the Fairway buoy, and sound their whistles. They must not attempt to proceed from the breakwater to the entrance of the pass, or to leave the buoy, until the dredger has signalled that the channel is clear. (3.) Vessels intending to enter the pass from seaward, must, on nearing Boghaz pass outer buoy, sound their whistles, and remain outside the pass until the dredger has signalled that they can proceed. (4.) Vessels are not to attempt to pass one another in the channel during dredging operations, and in the case of two or more vessels wishing to enter and leave the pass simultaneously, those inside the pass must remain at the fairway buoy, until arriving vessels have reached it. (5.) Pilots will refuse to take charge of vessels which do not comply with these regulations. (6.) Vessels are advised to take

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pilots during the time the work in the pass is in progress. (7.) Vessels entering or leaving must pass the dredger at slow speed. (8.) During the dredging operations, the pass can only be used during daylight when the day-signals can be clearly seen. The dredger, when at work during the night, will carry three *electric* lights—one at the bow, one at the stern, and one on the bridge. When not working at night, two *white* lights will be hoisted at the masthead.

220.—MEDITERRANEAN.—*Syria.—Beirût.—Harbour Works in Progress.*—During the construction of harbour works now in progress at Beirût, a signal during the day, and a *green* light at night, will indicate the position of submerged portions of the structure.

221.—RED SEA.—*Dangerous Shoal South-Eastward of the Zebayir Islands.*—Referring to notice in 1888, on a sounding of 14 fathoms having been obtained 10 miles south-eastward of the Zebayir islands, Commander W. U. Moore, H.M. surveying-vessel *Penguin*, reports that a depth of 22 feet has been found where the above 14 fathoms was obtained, or in lat. 14° 57′ 15″ N., long. 42° 20′ 25″ E. This shoal (*Penguin Shoal*) lies in the track of vessels passing east of the Zebayir islands, which however they should never do, as the locality has not been sufficiently examined.

222.—AFRICA.—*West Coast.—Shoal Reported Northward of Cape Frio.*—Information of the reported existence of a shoal lying with cape Frio bearing S. ¾ E. (approximately), distant about 26 miles. This shoal (*Clan Alpine shoal*), on which the British steam-vessel *Clan Alpine*, drawing about 21½ feet, is stated to have struck in January, 1890, is said to be from 3 to 5 miles from the shore, and presents a danger to shipping. Position, to be considered very doubtful, lat. 18° 2′ S., long. 11° 47′ E. *Variation*, 24° *W.*

223.—AFRICA.—*S.E. Coast.—Algoa Bay.—Visibility of Cape Recife Light.*—Information derived from the report of a Court of Inquiry held at Port Elizabeth, on 30th January, 1890, into the loss of the s.s. *Strathblane* by striking on a rock near the shore westward of cape Recife; the vessel afterwards being beached 5 miles westward of the cape, near Chelsea point, in the night of

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23rd January, 1890. From the evidence it appears that, the light at cape Recife is visible close to the shore westward of the cape, inside the limit shown on the Admiralty Charts, and mentioned in Africa Pilot, Part III. This limit of visibility is given on the authority of a notice issued by the Government of the Cape of Good Hope, on the establishment of the light on cape Recife in the year 1851 ; but in consequence of the above evidence the line will be erased from the Charts, and omitted from the Sailing Directions. It also appears from the above Inquiry, that foul ground may exist about 1 mile from the shore westward of Chelsea point for a distance of about 5 miles. Further, it is not improbable that the unsounded area fronting the coast between Chelsea point and Glassen point may contain many hidden, and as yet unknown dangers. Mariners are cautioned accordingly.

224.—AFRICA.—*East Coast.—Innambán River.—Buoyage and Beacons.*—To facilitate the pilotage of Innambán river entrance, and to indicate the channel towards Innambán, the five undermentioned buoys have been placed as follows (other buoys heretofore shown on Admiralty Chart, No. 650, having been withdrawn), and three beacons erected :—Four of these buoys are painted red, and should be left on the port-hand entering the river ; and one buoy, painted black, should be left on the starboard-hand. (1.) Bar buoy, painted red, is moored on the south side of the channel over the bar of the river in 3½ fathoms water, with Burra lighthouse bearing S ¼ W., and Algoa point clump W. by N. ¼ N., distant 3 4/10ths miles. (2.) A buoy, painted red, is moored on the N.W. edge of the bank on the southern side of the river entrance, in 6 fathoms water, with the Pedestal on the coast of Lingalinga peninsula bearing W. ⅛ S. distant 4/10ths mile. (3.) A buoy, painted red, is moored on the northern end of the spit westward of Mafarun islet, in 17 feet water, with that islet bearing S.E. ¼ E., distant 8 cables. (4.) A buoy, painted black, is moored on the western side of the channel, in 17 feet water, with Mafarun islet bearing S.E. by E. ¾ E., distant 1 1/10th mile. (5.) A buoy, painted red, is moored on the eastern side of the channel, in 4 fathoms water, with Makukoni point bearing S.S.E., distant 1 2/10ths mile. The three beacons are :—(*a.*) A beacon, named the Pedestal, constructed of masonry, and

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situated on the coast of Lingalinga peninsula, with Algoa point clump bearing N.E. by N., distant $2\frac{6}{10}$ths miles nearly. (*b.*) A beacon, constructed of wood, four sided, and surmounted by a disc, painted white, has been erected about 300 yards S. ¼ W. from Double Bush (Three trees) hill. (*c.*) A beacon of the same shape and colour as *b* beacon, has been erected on the western bank of the river, with Obra bearing N.N.E. and Makukoni point E. ¼ S.

Directions.—The leading mark over Innambán river bar, is the Pedestal in line with Double Bush beacon bearing W. by S. ¼ S. (leading nearly 2¼ cables northward of the bar buoy); having crossed the bar, the course should be altered to pass westward of buoy No. 2; a course should then be steered to pass between buoys Nos. 3 (red) and 4 (black); and thence to pass westward of buoy No. 5; the leading mark—Left tangent of Shikaki cliff in line with summit, bearing N. ¼ E. astern—should then be followed to the anchorage off Innambán. At the entrance to the bar, and near the bar buoy, depths of 17 feet have been obtained at H.W. neap tides, but there is not almost always a heavy swell, and vessels drawing more than 14 feet should not enter the river without a pilot. At times the sea breaks right across the river entrance, when such is the case, only steam-vessels of good power and light draught should attempt to cross the bar.

Caution.—The buoys are not to be depended upon. *Variation*, 21° *W.*

225.—Africa.—*East Coast.—Mouths of River Zambesi.—Information Concerning River Chinde.*—Referring to notice in 1889, on information concerning river Chinde. The following further information has been received from Lieutenant and Commander A. F. Balfour, H.M. surveying-vessel *Stork*:—Northward of river Chinde entrance, there are conspicuous sand hills on the coast; they bear N. 54° E. from the outer beacon on Mitaone point, distant $2\frac{6}{10}$ths miles. The outer beacon (white triangle on a pole) on Mitaone point has been shifted about 30 yards north-eastward of its previous position. A beacon has been erected on Foot point, consisting of a pole about 18 feet high, and surmounted by a cask, but it is not easily distinguished from seaward; from it, the outer

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beacon on Mitaone point bears N. 75° E., distant about 1½ mile. The bar beacons are now in line bearing N. 29° W., and lead over the outer bar in about 7 feet, and over the inner bar in less than 5 feet at L.W. The shoal water on the outer bar has extended northwards, since the examination in July-August, 1889.

Directions.—The following directions lead over the bars in not less than 7 feet at L.W.; but they are approximate only, and as the bars are subject to change, they should be sounded over before entering the river. Steer towards the entrance with the western of the four palms bearing N.W. ½ N.; when about 3½ miles from Mitaone point, bring the beacons on that point in line bearing N. 29° W., keeping them so, until the western palm bears N. 42° W. and Foot point beacon N. 56° W., the course should then be altered gradually to N.W. ½ W., and just before the inner beacon (white disc with black centre) on Mitaone point bears N. 20° W., alter course quickly to the northward, and bring it ahead on this bearing, which leads over the inner bar in about 8 feet at L.W. *Variation*, 17° *W.*

226.—AFRICA.—*East Coast.—Shoal S.E. of Cape Melinda.*—Commander J. M. McQuhae, H.M.S. *Cossack*, reports the existence of a shoal, with a depth of 5½ fathoms, the bottom being distinctly visible, lying with cape Melinda bearing N.W. by N., distant about 5½ miles. Position (marked P.D.), lat. 3° 21′ S., long. 40° 12½′ E. *Variation*, 8° *W.*

227.—INDIA.—*West Coast.—Harbour Light at Alibág.*—On 6th August, 1889, a harbour light was exhibited on Alibág fort signal station. Alibág light is a fixed *green* light, visible from the bearing of N. by E. ½ E. to N. by W. ½ W., elevated 32 feet above the sea, and should be seen from a distance of 4 miles. Position, lat. 18° 38′ N., long. 72° 51½′ E. *Variation*, 1° *E.*

Note.—This light is for the benefit of fishing-boats and coasting craft making for Alibág road.

228.—INDIA.—*West Coast.—Vingorla Rocks or Burnt Islands.—Alterations in Light.*—On 1st March, 1890, a new light would be exhibited on Vingorla rocks or Burnt islands. It is a *fixed white* light, elevated 132 feet above the sea. It is situated on the island, distant 3¾ cables from the old lighthouse. Illuminating apparatus,

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diopric, or by lenses, of the fourth order. Position, approximate, lat. 15° 53′ 20″ N., long. 73° 27′ 15″ E. *Variation*, 1° *E.*

229.—CEYLON.—*South Coast.—Point de Galle Light.—Alteration in Character.*—On or about 1st April, 1890, the following alteration would be made in the character of Point de Galle light. It is a *double flashing white* light *every half minute*, the flashes being of *two seconds'* duration each, with an interval of *three seconds* between them.

230. — BAY OF BENGAL. — *Eastern Shore. — Arakan River Entrance.—Savage Island.—Provisional Light Exhibited.*—With reference to Notice 171, p. 341, and previous notice, on intended alterations in Savage island light, south side of Arakan river entrance; and exhibition of provisional light pending such alterations; also, that on 27th January, 1890, the permanent light would be re-exhibited. On 2nd February, 1890, the provisional light (*fixed* and *flashing* white *every minute*) on Savage island was re-exhibited, having been transferred from the lighthouse to a temporary wooden structure, situated close to and southward of the lighthouse, and at the same height (99 feet) above H.W.; and that on the same date, the blue lights, burnt during the period occupied in transferring the light to the temporary structure, were discontinued. As the light exhibited from the temporary wooden structure is obscured to the northward by the permanent lighthouse, a *fixed white* light is shown from the flagstaff on Fakir point, as a guide to vessels during the night. The date of re-exhibition of the permanent light is uncertain.

231.—BAY OF BENGAL.—*British Burma. — Pegu. — Bassein River Approach.—Depths on Southern Part of Alguada Reef.*—Information from Commander R. F. Hoskyn, R.N., in charge of India Marine Survey, relative to depths recently found to exist on the southern part of Alguada reef, approach to Bassein river from the southward:—(1.) A rock, with a depth of 2¼ fathoms, lies with Alguada reef lighthouse bearing N. ¼ E., distant $1\frac{3}{10}$ths mile. Position, lat. 15° 40′ 30″ N., long. 94° 10′ 30″ E. (2.) A depth of 5 fathoms was found with Alguada reef lighthouse bearing N. by E., distant $1\frac{8}{10}$ths mile. Position, lat. 15° 40′ N., long. 94° 10′ 20″ E. *Variation*, 3° *E.*

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Note.—The tidal streams in the vicinity of Alguada reef set with considerable velocity, and the water is much discoloured. Pending the completion of the survey of the locality, vessels should keep at least 3 miles southward of the lighthouse, as there may be less water than that given near position (2).

232.—Bay of Bengal.—*British Burma.—Gulf of Martaban. —Moulmein River Entrance. — Alteration in Channels.* — The channels at Moulmein river entrance have entirely altered since the survey was made in 1877. The only available passage lies north of Balugyun sands, which is marked by buoys—black to starboard, red to port, on entering. Pilots are necessary, and can be obtained at Amherst.

233.—China Sea.—*Malay Peninsula.—East Coast.*—(1.) *Pahang River.—Harbour-Light at Entrance.*—A harbour-light is now exhibited from a pole placed on the northern side of Pahang river entrance, east coast of Malay peninsula. It is a *fixed red* light, elevated 22 feet above the sea, and visible from a distance of about 5 miles. Position, approximate, lat. 3° 32′ 30″ N., long. 103° 27′ 20″ E.

(2.) *Kuantan River.—Harbour-Light at Entrance.*—A harbour-light is now exhibited from a pole placed on the southern side of Kuantan river entrance, east coast of Malay peninsula. It is a *fixed white* light, elevated 25 feet above the sea, aad visible from a distance of about 6 miles. Position, approximate, lat. 3° 50′ N., long. 103° 20′ E.

234.—Celébes Sea.—*Talautse Isles.—Sangir Island.—West Coast.— Manganitu Bay.—Reef Reported in Approach.*—The master of the Netherlands Government steam-vessel *Havik*, has reported the existence of a reef, lying in the approach to Manganitu bay from the westward, west coast of Sangir island. A reef in the approach to Manganitu bay from the westward lies with islet in Manganitu bay bearing E. by N. ¾ N., and the edge of Kalangan N. by W. ¼ W. There is a channel between the reef and the fringing reef of the coast. Approximate position, lat. 3° 30′ N., long. 125° 26′ E. (marked P.D.). *Variation*, 2° *E.*

235.—Japan.—*Nipon.—South Coast.—Gulf of Tokio or Yedo.— Yokohama Bay.—Light-Vessels Marking Heads of Breakwaters in*

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Progress.—On 20th March, 1890, and during the construction of two breakwaters in Yokohama bay, lights would be exhibited from light-vessels placed to mark the east and north breakwater heads, and to guide vessels entering or leaving the harbour through the fairway between them. The east breakwater will extend in a northerly direction about 9 cables, from a position about one cable north-eastward of Nakamura Gawa (creek in foreign settlement) entrance, eastern part of Yokohama. The North breakwater will extend in a S.E. direction about $1\frac{1}{10}$th mile from a position about 2 cables eastward of the east angle of Kanagawa fort. A channel for boats will be left between the inner end of either breakwater and the shore.

(1.) *East Breakwater Light-Vessel* shows a *fixed green* light, elevated 32 feet above the sea, and visible from a distance of about 4 miles. The vessel, painted green, with a green ball at the masthead, is moored in 5 fathoms water, about one cable eastward of the breakwater head.

(2.) *North Breakwater Light-Vessel* shows a *fixed red* light, elevated 32 feet above the sea, and visible from a distance of about 4 miles. The vessel, painted red, with a red ball at the masthead, is moored in 5 fathoms water, about one cable eastward of the breakwater head.

Note.—Vessels entering or leaving the harbour must pass between the light-vessels, which are about one cable apart. Entering, they should, to clear the breakwater heads, steer west (as nearly as possible) for a distance of at least 2 cables after passing the light-vessels, and when leaving, steer east for at least 2 cables before coming to the light-vessels.

236.—AUSTRALIA. — *East Coast. — Great Sandy Strait. — Additional Lights.*—Seventeen additional lights have been established in Great Sandy strait. These will be placed on future copies of Admiralty Plan, Great Sandy strait, southern portion, No. 1030.

237.—AUSTRALIA.—*East Coast.—Moreton Bay.—Howe or North Channel.—Alteration in the Positions of Certain Lighthouses.*—With reference to Notice 80, p. 163, and Notice 130, p. 254, relating to Howe or North Channel; on 5th February, 1890, the position of

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Tangaluma lighthouse would be shifted north-eastward, and vessels entering Moreton bay by Howe channel should keep Cowan Cowan and Tangaluma lighthouses in line, or Tangaluma lighthouse slightly open westward of Cowan Cowan lighthouse, when passing East bank; and having passed East bank, should not open Tangaluma lighthouse westward of Cowan Cowan lighthouse, until they have proceeded a distance of one mile, when Cowan Cowan lighthouse should be steered for as heretofore. Also, it is possible the position of Yellow patch lighthouse may not be altered on the same date, but the sector of *red* light shown from it would in either case be the same, and Howe channel in that respect should be navigated as previously.

238.—AUSTRALIA.—*South Coast.—Portland Bay.—Particulars of Harbour Lights.*—Referring to notice in 1889, concerning intended alteration in the position of Battery hill (Observatory hill) light, Portland bay; on 10th March, 1890, Battery hill light would be discontinued, and a light exhibited on Whaler point instead; Whaler point light is *fixed green*, visible from the bearing of S.W. by S., through west, to N.W. ½ W., and should be seen from a distance of 12 miles. Position approximate, lat. 38° 20¼′ S., long. 41° 36½′ E. *Variation*, 7° *E.* Also, Portland jetty light, *fixed red*, is visible from the bearing of S. by W. ½ W., through west, to W. by N. ¾ N.

Note.—Vessels approaching Portland bay from the westward, should, after passing Lawrence rock, open Whaler point light bearing N.W. ½ W., and steer towards it, the anchorage ground being reached when the jetty light bears about W.S.W.

239.—NORTH AMERICA.—*U.S. Pacific Coast.—California.—San Francisco Harbour.—Oakland Harbour Entrance.—Alteration in Character of Fog-Signal.*—With reference to Notice 134, p. 256, on the establishment of a fog-signal at a lighthouse recently erected in a depth of about 10 feet, about one cable westward of the extremity of Oakland harbour north jetty, eastern side of San Francisco harbour; on or about 31st March, 1890, the following alteration would be made in the character of the fog-signal:—During thick and foggy weather, the fog-bell at Oakland harbour entrance will be struck by machinery once (single blow) *every five seconds*. Position, lat. 37° 47′ 55″ N., long. 122° 19′ 55″ W.

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240.—North America.—*U.S. Pacific Coast.—California.—Point Ano Nuevo.—Light on Ano Nuevo Island.*—On 12th February, 1890, a light would be exhibited from a post placed in front of the fog-signal station on Año Nuevo island. It is a *fixed white* light. Position on Admiralty Charts, lat. 37° 6′ 35″ N., long. 122° 20′ 15″ W.

241.—South America.—*Chile.—Patagonian Channels.—Smyth Channel.—Particulars of Shoal Island Beacon.*—With reference to notice in 1889, that a beacon had been erected on the summit of Shoal island, Smyth Channel. Shoal island beacon, 22 feet high, constructed of iron, pyramidal in shape, and three sided, is surmounted by a frame globe. Position, lat. 52° 33′ S., long. 73° 38′ W.

242.—South America.—*West Coast.—Patagonian Channels.—English Narrows Approach.—Particulars of Shoal N.E. of Eve Point.*—Referring to notice in 1889, on the existence of a shoal lying north-eastward of Eve point, about 7 miles southward of English narrows. This shoal (*Memphis shoal*), on which the German steam-vessel *Memphis* struck, about 1¼ cable in length, and three-quarters of a cable in breadth, has 2 to 10 fathoms water over it, increasing gradually to 25 fathoms around; it lies with Eve point, Bishopp island, bearing S. 34° W., distant 3¾ cables. Position, 49° 5¼′ S., long. 74° 23′ W. *Variation*, 21° *E.*

Note.—It is probable that a buoy will be placed to mark Memphis shoal, the position of which, at slack water, is generally indicated by kelp.

243.—South America.—*East Coast.—River Amazons.—Western Branch Entrance.—Light on Balique Island.*—Referring to Notice 142, p. 258, on the intended exhibition of a light on Balique island, western branch entrance, river Amazons, on 23rd March, 1890, the light would be exhibited. It is a *revolving white* light *every minute*, visible *thirty seconds*, and eclipsed *thirty seconds*, elevated 59 feet above the sea, and should be seen from a distance of 13 miles. Illuminating apparatus dioptric, or by lenses, of the fifth order. The lighthouse, 51 feet high, constructed of iron, and cylindrical in shape, rises above the keeper's dwelling, the whole painted white. Position, lat. 1° 0′ N., long. 49° 55¾′ W.

244.—United States.—*Delaware.—Delaware River.—Reedy Island Lighthouse.—Sector of White Light.*—The shoal ground

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extending southward from the south end of Reedy island, Delaware river, is now covered by a narrow sector of *white* light (dividing the former sector of *red* light into two sectors) shown from Reedy island lighthouse. The sector of *white* light, *flashing every thirty seconds*, is shown from Reedy island lighthouse between the bearings of N. $\frac{3}{8}$ E. and N. by E. $\frac{7}{8}$ E. approximate. In other respects the character of the light remains unaltered. Position, lat. 39° 30′ N., long. 75° 34′ W. *Variation*, 6° *W.*

245.—UNITED STATES.—*Rhode Island.—Narragansett Bay.—Eastern Passage.—Light and Fog-Signal on Castle Hill.*—On or about 1st May, 1890, a light will be exhibited from a lighthouse recently erected on the west side of Castle hill, east side of Eastern passage, Narragansett bay. It will be a *flashing red* light *every thirty seconds*, of the fifth order, elevated 38 feet above H.W., and visible from a distance of about 11 miles. The lighthouse consists of a conical granite tower on a granite pier, lantern black. Position, lat. 41° 27′ 40″ N., long. 71° 21′ 50″ W. Also, a fog-signal will be established on Castle hill. The fog-signal at Castle hill lighthouse will be a bell, struck by machinery, which, during thick or foggy will be sounded *once every fifteen seconds.*

246.—NOVA SCOTIA.—*South Coast.—Pubnico Harbour Entrance.—Beach Point Light.—Range of Visibility.*—The lighthouse on Beach point, east side of Pubnico harbour entrance, has been increased in height, and somewhat altered in appearance. Beach point light, *fixed white*, is now elevated 41 feet above H.W., and visible from a distance of 11 miles. In other respects it is unaltered. The lighthouse, 40 feet high, consists of a square wooden tower, painted white, with keeper's dwelling attached. Position, lat. 43° 36′ N., long. 65° 47′ W,

247. — PRINCE EDWARD ISLAND. — *Charlottetown Harbour Entrance.—Blockhouse Point Lighthouse.—Sector of Red Light Discontinued.*—Consequent on the establishment of Hazard point leading lights, the sector of *red* light shown from Blockhouse point lighthouse, western side of entrance to Charlottetown harbour, which indicated the direction of the bell-buoy, is no longer required, and will therefore be discontinued from the opening of navigation in 1890.

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248.—Gulf of St. Lawrence.—*Magdalen Islands.—Grindstone Island Lighthouse.—Discontinuance of Fog-Signal.*—It having been found that the steam fog-whistle heretofore maintained near Etang du Nord, west coast of Grindstone island, is so placed that it cannot be heard from vessels until they are in dangerous proximity to the outlying reefs in the vicinity, it will be discontinued from the opening of navigation in 1890. Position, lat. 47° 23′ N., long. 61° 57′ W.

249.—River St. Lawrence.—*Red Islet Light.—Intended Alteration in Character.*—On 1st July, 1890, the following alteration will be made in the character of the light on Red islet, river St. Lawrence. Red islet light will be a *group flashing* white light *every fifty seconds*, showing *three flashes* with intervals of *ten seconds* between their points of greatest brilliancy, followed by an interval of *thirty seconds;* during the greater part of which the light will be totally eclipsed. In other respects the light will remain unaltered. Position, lat. 48° 4′ 20″ N., long. 69° 32′ 55″ W.

250.—River St. Lawrence.—*Isle St. Thérèse.—Particulars of Lights on N.E. Part.*—Particulars concerning the leading lights on the N.E. part of Isle St. Thérèse :—(1.) The *High Light, fixed white*, on Isle St. Thérèse (N.E. part) is elevated 48 feet above the ordinary level of the river, and visible from a distance of 12 miles, through a small arc on each side of the line of direction of the leading lights. Illuminating apparatus catoptric, or by reflectors. The lighthouse, 42 feet high, is a square wooden building, painted white. (2.) The *Low Light, fixed white*, should be visible from a distance of 10 miles, through a similar arc to the high light, from which it is distant 200 yards. The lighthouse, of wood, and painted white, is placed on an open post foundation close to the water's edge. Position, lat. 45° 41′ 20″ N., long. 73° 27′ 45″ W. *Variation*, 14° *W.* These lights kept in line bearing S. 50° W. lead through the centre of the dredged channel from the vicinity of cape St. Michael.

Wrecks Reported in Positions Dangerous to Shipping.

4.—North Sea.—*Information Concerning Certain Dangerous Sunken Wrecks.*—With reference to Notice, p. 169, *Nautical Magazine*, February, 1890, on the existence of two dangerous

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sunken wrecks in the North sea, the following particulars are now promulgated for the guidance of mariners, until more precise information can be given. The two large steamers *Gaw Quan Sia* and *Leerdam* collided in a fog on 16th December, 1889, both steamers eventually sinking within a mile of one another, after floating for about 12 hours. From the circumstances of weather and drift, the positions were very doubtful, and they have since been reported as follows, by different passing vessels. (1) lat. 52° 10′ N., long. 3° 14′ E.; (2) lat. 52° 24′ N., long. 3° 21′ E.; (3) lat. 52° 27′ N., long. 3° 2′ E.; (4) lat. 51° 58′ N., long. 3° 2′ E. The last position is however undoubtedly the most accurate, having been obtained by the salvage steamer *John Dixon* on 8th January, 1890, when she observed a latitude at noon alongside the wreck of the *Gaw Quan Sia*, the longitude being by dead reckoning. The topmasts of both vessels, and the *Leerdam's* topsail yard, were at first out of water, but by the time H.M.S. *Penguin*, sent especially in January to accurately fix the positions, arrived, these had been broken off, and nothing remained to show their positions. *Penguin* was therefore unable to carry out this service. There is now however no doubt that the heads of the four lower masts, which are of iron, present a great danger to shipping, as the depth of these below the surface at L.W. cannot be much more than 15 feet, and may be considerably less, both vessels having lower masts of 100 feet from keel to cap. The stumps of the topmasts probably also project above the caps. The report of Messrs. Gann, who have been waiting for fine weather to attempt to find the *Gaw Quan Sia*, and commence salvage operations, is as follows:—"*Leerdam* lies about a mile N.N.W. of *Gaw Quan Sia*. Both vessels are quite upright. Depth alongside *Gaw Quan Sia* 19 fathoms, and about one fathom less alongside *Leerdam*. A spar, lying flat on the water, was moored as a buoy close to the *Gaw Quan Sia* on 8th January, but has not since been seen." The wreck of *Gaw Quan Sia* has been placed on the Admiralty Charts in lat. 51° 58′ N., long. 3° 2′ E. The other wreck one mile to N.N.W.; and a note, "one fathom over iron masts, position approximate," written against them.

Caution.—As these wrecks lie, whatever their precise positions,

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in the track of vessels passing through the North sea between the strait of Dover and the north, and in other directions, the greatest care is necessary to avoid passing near the positions given. *Variation*, 15° *W.*

5.—North Atlantic Ocean.—*Floating Wreck.*—The commander of the steam-vessel *Winston* has reported having passed, on 4th March, 1890, in a position dangerous to shipping, a wrecked vessel, apparently of about 600 tons burden, lying on her port beam ends, in lat. 48° N., long. 22° W. The ship *Josephine*, of Laurvig, reported in Notice, p. 849, *Nautical Magazine*, April, 1890, as being in lat. 49° 33′N., long. 24° 46′ W., on 31st January, 1890, might possibly have recently drifted to this position. In this locality, the current generally sets to the eastward about 14 miles a day.

6.—North Sea.—*Jutland.—N.W. Coast.—Sunken Wreck S.W. of Hirtshals Point.*—The steam-vessel *H. J. Pallisen* lies sunk about 18 miles S.W. of Hirtshals point, and 6 miles from the nearest shore. The wreck, with masts showing above water, lies in about 8 fathoms, in a position dangerous to shipping, with Hirtshals point lighthouse bearing E.N.E., and Ingstrap church S.E. ½ S., distant 8½ miles. Position, lat. 57° 24′ N., long. 9° 30′ E. *Variation*, 14° *W.*

OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,
April 18th, 1890.

The following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

Note.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to

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Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
1825B	Irish Channel. Sheet II. ...	Plan Holyhead Bay. March.
1402	Italy: Ports Maurizio and Oneglia	New Chart. March.
1405	Italy, W.: Ports and anchorages, Plans Agropoli Bay, Scario Anchorage, and Port Palinuro	New Chart. March.
2736	India, W.: Gulf of Kutch to Viziadurg	Plan Pur Bunder erased. Plan Diu Harbour altered. March.
1321	India, W.: Kathiawar Coast, Plans Porbandar and Navibandar	New Chart. March.
1342	Cochin China: Fan Rangbay to Tong King Gulf	Extensive corrections, also plan, Fuzen and Ku Mong harbour. March.
1379	Australia, E.: Plans in New South Wales, Richmond River entrance, Cape Byron Bay, Hastings River, Port Macquarie, Clarence River entrance	New Chart. March.
1060	Society Islands: Western Group	Bora Bora and Huaheine Islands. March.
2531	North America, W.: Cape Mendocino to Vancouver Island	Extensive alterations and additions all along the coast. March.
1412	West Indies, Curaçao Island, St. Ana Harbour	New Chart. April.
2799	South America, W.: Ecuador, Plans	Plan. Caraccas River cancelled by new plan, 1393. February.

Agent for the sale of Admiralty Charts, Mr. J. D. Potter, 31, *Poultry, London, E.C.*

Board of Trade.—Mr. G. J. Swanston, C.B., has been appointed to be Assistant-Secretary for the Marine Department, in the place of the late Mr. Thomas Gray. Mr. A. D. Berrington, Chief Inspector of Fisheries, has been appointed to succeed Mr. Swanston as Assistant-Secretary for the Fisheries Department.

The Life Saving Appliances Committee, Mr. Thomas Ismay, Chairman, met at the Board of Trade on Tuesday and Wednesday, the 15th and 16th April, to re-consider the Rules framed under the under the Life Saving Appliances Act. A deputation of the short sea and Coasting Trade Services attended to lay their views on the Rules before the Committee.

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OFFICIAL RETURN OF BRITISH WRECKS IN MARCH, 1890.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of March, 1890, and the number of lives lost, are as follows:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	46	7,593	26
Steam	16	8,952	35
Total	62	16,545	61

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in March relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—GEORGE J. SWANSTON, Assistant-Secretary, Marine Department.—Board of Trade, 2nd April, 1890.

THE Board of Trade have granted the rewards mentioned below to the master and certain members of the crew of the German s.s. *Ems*, of Bremen, which attempted to rescue the crew of the schooner *Hebe*, of Greenock, which was disabled in a hurricane in the North Atlantic, on the 22nd of February, 1890, and to the master and certain members of the crew of the British s.s. *Colonist*, of London, which, two days later, took the shipwrecked men off the wreck of the vessel. A piece of plate to Mr. James Sanders, master of the *Ems*, a gold shipwreck medal to Charles Pollack, third mate, and silver medals to Joseph Herold, William Falkenburg, and Robert Schmidt, seamen of that vessel; a binocular glass to Mr. Alfred Corner, master of the *Colonist*, a bronze medal to W. H. Parker, third officer, and sums of £2 each to Daniel Flynn, J. Jacobson, A. Sheridan, and Francis Young, seamen of that vessel.

THE Board of Trade have received through the Foreign Office, a silver medal and diploma, which have been awarded by the Spanish Government to Mr. Lindquiester, master of the British s.s. *Hesperia*, in recognition of his services in rescuing the shipwrecked

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crew of the Spanish brigantine *Iôven Antonio*, which was wrecked 60 miles west of Lisbon, on the 23rd of September, 1889.

The Board of Trade have received through the Foreign Office, a silver medal and diploma, which have been awarded by the Spanish Government, to Mr. Andrew Hughson, master of the s.s. *Robert Harrowing*, of Whitby, in recognition of his services in rescuing the crew of the Spanish vessel, *Joven Vicenta*, which was wrecked at Cape Gata, on the 23rd June last.

The Board of Trade have awarded binocular glasses to Mr. G. Belbeoch, and Mr. G. Féchant, masters respectively of the French fishing smacks *Ave Maria* and *Formidable*, of Donarnenez, in recognition of their kindness and humanity to the shipwrecked crew of the s.s. *Excelsior*, of Cardiff, whom they rescued in the Bay of Biscay, on the 4th January, 1890.

Official Inquiries at Home, 1890.

4011. *Thalia*, s.s.; built at West Hartlepool, 1883, tonnage, 1,225; Savannah to Reval; cotton; stranded on the Revalstone, Gulf of Finland, January 15, 1890. Inquiry held at West Hartlepool, March 13, 1890, before Walker and Fisher, Justices; Methven and Baker, N.A. Stranding caused by master mistaking in thick weather Nokskar Light for the Revalstone Light, he being ignorant of the withdrawal of the latter lightship during the winter months owing to his not having proper sailing directions.

4016. *Gleaner*, fishing smack, and *Zamora*, s.s.; former owned by Mr. L. Gray: tonnage, 40; May Island to Fisherrow; latter built at Leith, 1889; owned by Messrs. Currie and Walker; tonnage, 773; Hamburg to Grangemouth; general; in collision in Firth of Forth, February 8, 1890, when former sank and two lives were lost. Inquiry held at Edinburgh, March 19, 1890, before Rutherfurd, Judge; Powell, Hore, and Bragg, N.A. Collision owing to *Zamora* proceeding at too great speed in a fog, and to *Gleaner* showing no lights, and making use of an improper fog-signal. Certificate of master of *Zamora* suspended for three months.

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4018. *Inva*, steam yacht; built at Gosport, 1878; owned by Mr. P. D. Grenfell; tonnage, 125; Portsmouth to Monte Carlo; stranded near Cape Trafalgar, Spain, January 3, 1890, when six lives were lost. Inquiry held at Westminster, March 18, 1890, before Marsham, Judge; Parish, Ronaldson, and Pickard, N.A. Casualty caused by skipper over-estimating his distance from Trafalgar Light, and not hauling out sufficiently to the S., to give the shoals a wide berth. Censured.

4019. *Florence Nightingale*, s.s.; built at Sunderland, 1878; owned by Mr. J. F. Marshall, and others; tonnage, 629; Burntisland to Dieppe; coal; stranded near Cayeux Light, France, February 23, 1890. Inquiry held at Sunderland, March 19, 1890, before Potts and Cameron, Justices; Baker and Brooks, N.A. Casualty owing to no measures having been taken to verify Cayeux Light, which was thought to be Point D'Ailly Light. Certificates of master and mate suspended for six months; recommended for certificates of a lower grade.

4026. *Claymore*, s.s., and *Coriolanus*, ship; former built at Partick, 1883; owned by Claymore Steamship Company, Limited; tonnage, 1,657; Norfolk, Virginia, to Liverpool; cotton; latter built in 1876; owned by Mr. P. Hunter and others; tonnage, 1,045; from Iquique with nitrate; in collision in lat. 50° N., long., 20° W., February 24, 1890, when both vessels were abandoned. Inquiry held at Westminster, April 3, 1890, before Marsham, Judge; Ronaldson and Parfitt, N.A. Collision owing to second mate of *Claymore* leaving bridge without anyone in charge, or on the look-out. Certificate suspended for six months.

Inquiries by Inspectors, 1890.

38. *Bolan*, ship; built at Southampton, 1882; owned by Messrs. Brocklebank; tonnage, 1,999; Calcutta to London; Indian produce; not heard of since spoken in lat. 32° 30′ S., long. 32° 25′ E., July 5, 1889. Inquiry held at Liverpool, March 12, 1890, before Bragg, Inspector. Vessel probably capsized or foundered in hurricane of July 17. She was undermanned with but 30 hands all told.

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39. *Blagdon*, s.s.; built at Blyth, 1881; owned by Mr. J. Whitfield; tonnage, 1,292; Reval to London; oats; not heard of since sailing, December 10, 1889. Inquiry held March 24, 1890, before Brooks, Inspector. Vessel probably struck Vinkova shoal during a gale with snow, floated off and foundered.

40. *Glanpadarn*, barque; built at Sunderland, 1878; owned by Mr. D. P. Williams; tonnage, 1,081; Rangoon to the Channel, rice; not heard of since sailing, April 26, 1889. Inquiry held at Liverpool, March 22, 1890, before Richardson, Inspector. Vessel seaworthy, but shifting boards should have been thicker than 1¼ inch. No evidence as to cause of loss.

Fishery Inquiries, 1890.

S. 36. *Imogene*, ketch; built at Burton Stather, 1878; owned by Mr. R. W. Ralph; tonnage, 76; Hull to Lowestoft; stranded on Blakeney Beach, February 14, 1890. Inquiry held at Lowestoft, March 14, 1890, before Fowler and Maddison, Justices; Anderson and Cosens, N.A. Loss caused by vessel having been kept too long on a course leading directly on to the land. Certificate of second hand suspended for four months. System of leaving only one hand on deck at night a reprehensible one.

S. 37. *Gladiator*, and *Secret*, ketches; former built at Grimsby, 1876; owned by Mr. A. Doust; tonnage, 70; Grimsby to Dogger Bank; latter built at Grimsby, 1877; owned by Mr. G. Kennedy; tonnage, 72; Dogger Bank to Grimsby; in collision in North Sea, February 13, 1890, when former sank and four lives were lost. Inquiry held at Hull, March 24, 1890, before Twiss, Judge; Ward, Curme and Cuninghame, N.A. Collision brought about by the *Gladiator*, close-hauled on starboard tack, having improperly luffed up. Both skippers blamed for leaving their respective vessels in sole charge of one hand.

Official Inquiries Abroad, 1890.

4012. *Ranelagh*, s.s., and *Konoowarra*, s.s.; in collision in Mary River, December 1, 1889. Inquiry held at Brisbane, January 31, 1890. Collision occurred at night in an awkward elbow of the

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river, but *Konoowarra*, which was proceeding against tide, should have waited till *Ranelagh* had passed.

4013. *Scotia*, schooner; stranded at Kiama, December 26, 1889. Inquiry held at Sydney, January 20, 1890. Casualty owing to wind failing when vessel was attempting to enter the port, and to anchors dragging.

4014 *Clan Alpine*, s.s.; stranded off Cape Frio, January 26, 1890. Inquiry held at Cape Town, February 13, 1890. Casualty owing to master navigating too close to a coast imperfectly known.

4015. *Leander*, barquentine; stranded on South Point Shoals, Barbados, January 17, 1890. Inquiry held at Bridgetown, Barbados, February 5, 1890. Casualty owing to master neglecting to take cross bearings of lights in sight. Reprimanded.

4017. *Norsa*, s.s.; wrecked off Akurali point, Ceylon, January 16, 1890. Inquiry held at Galle, January 31, 1890. Stranding owing to current. Certificate of master suspended for six months for prematurely abandoning vessel.

4020. *Norkoowa*, s.s.; stranded in Wreck Bay, December 18, 1889. Inquiry held at Sydney, January 6, 1890. Stranding due to master navigating too close to the shore, and neglecting the lead. Certificate suspended for three months.

4021. *Rose of Sharon*, s.s.; stranded on three occasions between Tambo River and Gippsland Lakes Entrance, December 11 and 12, 1889. Inquiry held at Melbourne, December 24, 1889. Strandings owing to careless navigation of master. Certificate suspended for four months, and ordered to pay £10 towards costs.

4022. *Rotorua*, s.s., and *Orawaiti*, s.s.; in collision off the Kaikouras, December 7, 1889. Inquiry held at Christchurch, N.Z., December 31, 1889. Master of *Rotorua* censured for ignoring Art. 18 of the Regulations, and ordered to pay costs, £7 7s.

4023. *Peru*, barque; stranded on Silloth Rocks, Barrier Reef, November 21, 1889. Inquiry held at Gisborne, N.Z., January 21, 1890. Stranding owing to master not taking a bearing of Wigton Island, and being absent from deck in dangerous waters. Ordered to pay costs, £8 8s.

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4024. *Giang Ann*, s.s.; stranded on Long Island Reef, Thousand Islands, January 19, 1890. Inquiry held at Singapore, February 15, 1890. Stranding owing to master mistaking the islands, and to second mate not keeping an efficient look out. Certificate of latter suspended for six months.

4025. *Ophelia*, barque; outbreak of fire when loading jute at Chittagong, January 19, 1890. Inquiry held at Chittagong, January 30, 1890. Fire probably caused by sparks from some coolie's hookah.

4027. *Benmore*, s.s.; stranded off Langgan Island, December 24, 1889. Inquiry held at Singapore, February 17, 1890. Stranding owing to master not at any time fixing position of ship on the chart. Certificate cancelled; recommended for one as second mate.

NAUTICAL GOSSIP AT HOME AND ABROAD.

THE *City of Paris* has been placed in dry dock at Liverpool, and it has been discovered that the port propeller shaft was fractured; but whether this was the cause or a result of the break down of the port engine is not authoritatively determined, although it appears probable that the former was the case.

MOST of the writers in the daily and weekly press have rushed to the conclusion that the big liner was saved in consequence of her exceptionally good bulkhead sub-division. This does not appear to have been the case. As a result of the accident the sea was admitted to both engine-rooms, and many, if not most, large ocean passenger ships would remain afloat with their engine-room compartment flooded. The danger is in case of an accident, by which two cargo compartments are opened to the sea. With an accident of this latter character the *City of Paris* would have been safe, because she has thirteen bulkheads, and consequently all the cargo compartments are exceptionally small.

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THE returns of shipping passing through the Suez Canal for the last three years have just been issued. The numbers of vessels in 1889 was less by 25 than that in the previous year, but the tonnage was greater by 142,353. The percentage contributed by Great Britain continues to increase, it was 76·5 in 1887, 78·6 in 1888, and 78·9 in 1889. The percentage for France, which takes the second place with 5·3 per cent., is less than it was. Germany now is third with 4·27, and Holland fourth with 3·07 per cent.

AMERICAN papers describe the largest wooden vessel now afloat the *Rappahannock*, recently built at Bath, Maine, at a cost of $125,000, her frame being of Virginia oak and her planking of pine. Her tonnage is 3,053 net, and her dimensions, length 287 ft., and breadth 48 ft. 7 ins. She is said to be the heaviest sparred ship that ever carried the stars and stripes, and her spread of canvas is 15,000 yards.

A MOVEMENT to establish a permanent representative committee as a court of appeal in the assignment of freeboards, and with power to alter the Tables of the Load-Line Committee has failed, the Bill having been read a third time without the amendment proposed with that view. As the Bill stands on leaving the Commons, load-lines must be assigned to every British ship within six months in accordance with the Tables of the Load-Line Committee, and approved by the Board of Trade. The Board of Trade are to accept an assignment by Lloyd's or by any corporation or registry approved by the Board at the option of the owner.

THE new White Star line *Majestic* has made the fastest first run of any vessel. She is 10,000 tons, and is sister to the *Teutonic*.

AT a recent meeting of the Royal Institution, Lord Rayleigh delivered an interesting lecture on the subject of *Foam*. He said that liquids which foamed were essentially impure, contaminated,—in fact, dirty. Sea water did not foam in consequence of the salt contained in it, but because of sea weeds and the destruction they underwent from breakers in rough weather. Having referred to the fact of the tendency of oil to spread upon water in a film of extreme tenuity, he came to the question of the effect of oil in

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preventing the formation of waves. That effect had been tested in recent years on a large scale at Peterhead, with a view to diminishing the danger to ships in rough weather. It was only the comparatively small ripples which were affected in the first instance, and not the large waves of the ocean, but it seemed as if the power of the wind to create those large waves was very much due to the small ripples which formed at the back of the waves, and gave the wind a much better hold on them than it would otherwise have. It was the breaking water, the curling tops of the waves that did the mischief, and that was what was quieted by the effect of the oil, so that the surface had its properties changed, and it refused to submit to the necessary extensions and contractions.

On the 7th February last, an accident occurred during the trial of the engines of H.M.S. *Barracouta* at the mouth of the Thames. The *Barracouta* has two double-ended boilers separated by a longitudinal bulkhead. Like most ships in H.M. Navy, she has arrangements for forced draught, but it is stated that when the accident occurred the forced draught, although in use, produced a very moderate air pressure in the stoke-hold. The funnels of the *Barracouta* are very short, and the forced draught in use at the time of the accident produced no more draught in the combustion-chamber than would have been obtained by means of a funnel of the usual length. The accident occurred about three-quarters of an hour after the trial commenced. Without any warning whatever, flames suddenly rushed out of all the ash-pits of the furnaces in the port boiler, enveloping both port stoke-holds (which were closed) in flames, and burning all the occupants. Two men were killed and the others much injured.

After a long and careful inquiry, which terminated on the 10th April, the Coroner's Jury came to the conclusion that the accident was caused by the combustion chamber-tubes and tube-plates becoming overheated from shortness of water or ebullition in the boiler, thereby producing local expansion and contraction, and allowing the steam to escape into the combustion chamber, and cut off the exit of the flames through the tubes.

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In the inquiry the Coroner was assisted by an expert assessor. The Admiralty submitted the evidence of Mr. Manuel, of the P. and O. Company, who had investigated the case for them, and the owners similarly were represented by Mr. W. Parker, of Lloyd's. It is noticeable that Mr. Parker came to the conclusion that it was not proved that there was shortness of water in the boiler at the time of the accident.

Mr. Parker's opinion was that "at the moment of the accident, from some cause difficult to explain, there was excessive heat in the combustion chamber, which caused the water to rise from the plates; that they then became red-hot; that at some period during the process of overheating the plates became buckled, and the tubes sprung, thereby admitting a heavy leakage of water into the chamber, and that this water at once flashed into steam, overcame the air-pressure of the fans, and drove the flames into the stoke-holds."

Important extensions are being made to the harbour at Ardrossan. At present there is a wet dock of considerable size and tidal quays, an excellent graving dock and slipway. The additions, which are expected to be completed early next year, include a wet dock capable of accommodating steamers of the largest dimensions, and a new tidal basin and piers, which will give accommodation for a greatly increased traffic. The whole of the works are to be protected by a substantial breakwater, which will shelter the harbour from the force of the north-west storms. The area of the new dock will be about ten acres, and the new outer basin about seven acres, the depth of water being 18 ft. and 27 ft. at low and high-water respectively. The cost of the whole works, when completed, is expected to be close upon £200,000.

Captain Blackmore has continued his interesting paper, read before the Shipmasters' Society of London, on the "British Mercantile Marine—Past, Present, and Probable Future," and Captain Holt has also contributed a valuable practical paper on "Shipping: Stability and Stowage." Both gentlemen treated their subjects with ability and earnestness. We doubtless shall have occasion to allude further to them in our pages.

TRITON.

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THE

NAUTICAL MAGAZINE.

FIFTY-NINTH YEAR.

VOLUME LIX.—No. VI.

JUNE, 1890.

COAL CARGOES.

THE important question of the dangers attending the sea carriage of coal has received fresh elucidation from an able paper read before the Institution of Naval Architects, by Professor V. B. Lewes, at the recent meetings. A large step was taken in the matter, when by the report of the Royal Commission in 1875, it was shown that the very means carefully provided at that time to secure safety were a source of danger, but it appears even now doubtful if quite the right course is taken for the prevention of accident. It is desirable at the outset to point out what has been so often stated, but what does not appear yet to be thoroughly understood, that there are two quite distinct dangers to be guarded against in the sea carriage of coal, and that they proceed from entirely different causes. So much is this the case, that the very means provided to prevent the one have often served to bring about the other. Explosion of coal gas on board ship is caused by coal giving off so much inflammable gas as to become explosive, when mixed with certain proportions of atmospheric air. Most explosions in ships carrying coal cargoes have occurred either in docks or harbours before the vessel has

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sailed, or within a week of the commencement of the voyage. The remedy provided for them, and, indeed, enforced by the Board of Trade, is surface ventilation, and official enquiries have usually found the cause of such explosions to be battening down hatches too quickly after shipping the coal, and having no means provided for carrying off the gas given off by the coal, and which hangs about over its surface, or penetrates through cracks in bulkheads to adjoining parts of the ship, where a light applied to it by accident produces explosion. The other danger, spontaneous ignition, occurs nearly always during long voyages, generally on voyages into the southern hemisphere, after the ship has passed the tropics. In illustration of this we may take three cases which were the subject of official enquiries during the past year. The ship *General Picton*, 1,199 tons, loaded in June, steam coals at Garston. On the 14th September, fire was first noticed, and in two days after the vessel was abandoned near Cape Horn. The barque *William Davie*, 794 tons, left Fleetwood on the 26th June, laden with steam coal for Valparaiso. On the 15th October, fire was discovered when the vessel was to the south-west of Cape Horn, and the vessel was abandoned on the 17th. The ship *King Robert*, 1,656 tons, sailed from Glasgow, 2nd August, with coals and general cargo, and was abandoned on fire near Cape Horn on the 8th November.

Ventilation, especially ventilation through the body of the coal, is in this regard a source of danger as supplying one of the inducing causes of spontaneous ignition, and also as tending to keep up combustion and to cause it to spread. The contrast between the two kinds of danger extends also to their consequences, seeing that explosions of gas have resulted in much injury to life and limb, but have so far as is known not been very largely responsible for total loss of the ship at sea, whereas spontaneous ignition often causes the loss of the ship, but brings it about in such a gradual way as to afford large opportunity for the crew to be saved.

Some idea of the importance of the subject may be obtained from the figures stated in the Appendix to the Report of the Royal Commission on Loss of Life at Sea. During the nine years ending 1883, 57 British coal-laden ships, of an aggregate tonnage of

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49,384, are known to have been totally lost owing to spontaneous combustion of cargoes. The total loss of life, however, was only 24. Of these vessels, only one (of 281 tons) was a steamer. During the same period, however, 49 British steamers, of 35,367 tons, and 279 sailing-ships, of 81,659 tons, coal-laden, were reported as missing, and the loss of life in them amounted to a total of 3,430. Some portion of this—how much it is, of course, impossible to tell—must be put down to spontaneous ignition of coal cargoes. In referring to these figures, Mr. Lewes remarks that the cases of actual loss form but a small percentage of the cases in which cargoes have heated and fired, but in which the vessel has been saved.

Mr. Lewes's paper, and the discussion following it, dealt chiefly, as the title indicates, with the causes of spontaneous ignition in coal cargoes, and the most appropriate precautions and remedies. We purpose placing the main features of the paper before our readers, with some comparison of its conclusions with those of the report of the Royal Commission of 1876, and concluding with a review of the further question of explosions in coal ships and of the precautions at present taken to prevent them.

Mr. Lewes begins by stating that, at the suggestion of Mr. Martell, he some time ago undertook a long series of experiments, and much of his paper embodies the results derived from them.

He first enumerates the ordinary constituents of coal, and then considers the effect of each of them in connection with his subject. The chief constituents of coal are carbon or charcoal, and the various hydrocarbons, some of which form tar, naphtha, &c., but besides these, coal also contains certain mineral bodies, which were mostly present in the sap and fibre of the original vegetation, and which give the ash which is left behind after the coal is burnt. These substances consist chiefly of sulphate of lime or gypsum, silica, and alumina, whilst in nearly all kinds of coal is to be found a substance called disulphide of iron, coal brasses or pyrites, and which gives the reddish brown colour to the ash left by many kinds of coal. Of the constituents of coal, those which play any part in the heating and spontaneous ignition are the carbon, hydrocarbons, and the *brasses*.

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Considering the action of these three separately, it is remarked that carbon is one of those substances which possesses the power of attracting and condensing gases upon their surfaces. Charcoal made from hard wood exhibits this power in a high degree, one cubic inch being capable of absorbing as much as 35 to 90 cubic inches of some gases, and 9¼ cubic inches of oxygen gas. The power of newly won coal in this respect varies with the variety of coal, but the least absorbent will take up 1¼ its own volume of oxygen, whilst in some coals more than three times their own volume of the gas is absorbed. The absorption is very rapid when the coal is newly exposed to the air; its rate gradually decreases and is largely influenced by temperature. It is at first purely mechanical, and causes a rise of temperature, which in the case of charcoal formed in close retorts as in preparing charcoal for powder making, would produce spontaneous ignition if it were not placed in sealed cooling vessels for some days before exposure to the air. If charcoal is kept for a day after it has been made out of contact with the air, and is then ground down to powder, the effect of the largely increased exposed surface as regards absorption is seen in the fact that it will frequently fire after exposure to the air for thirty-eight hours, whilst a heap of charcoal powder of 100 bushels or more will always ignite. In the case of coal, the absorption is rarely sufficient to bring about spontaneous ignition of itself.

Regarding the action of the bituminous constituents of coal, it is remarked that they are very small in anthracite and very great in cannel or shale. When the carbon of the coal absorbs oxygen, this compressed gas becomes very active, and tends to combine with the hydrocarbons of the bituminous portions of the coal. Chemical activity of this kind causes evolution of heat; the further rise of temperature again increases rapidity of oxidation, so that a steady rise of temperature is set up, and this taking place in the centre of a heap of small coal, which is a non-conductor of heat, will often cause such heating of the mass that if air can slowly percolate into the heap in sufficient quantity to supply the oxygen necessary to continue the action, the igniting point of the coal is soon reached. The effect of similar action to this is shown by the

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spontaneous ignition of oily cotton waste. To produce it, however, the oily matters must be animal or vegetable, since, strange to say, the heavy mineral oils have a remarkable influence in retarding heating.

The presence of *brasses* in coal has for years been adopted as the popular explanation of spontaneous ignition. The researches of Dr. Richters, in 1870, led him to the conclusion that they had very little to do with the matter. Professor Lewes, however, as the result of experiments, comes to the conclusion that *brasses* in large quantity may produce spontaneous ignition, but the condition of "large quantity" indicates that practically they have less to do with it than is usually supposed.

On examining the evidence as to the actual conditions of the case, it is found that liability to spontaneous ignition increases with :—

1. The increase in the bulk of cargoes. Evidence given before the Royal Commission of 1875, showed that in cargoes for shipments to places beyond Europe the cases reported amount to ¼ per cent. in cargoes under 500 tons; in cargoes from 500 to 1,000, 1 per cent.; 1,000 to 1,500 to 3·5 per cent.; 1,500 to 2,000 to 4·5 per cent.; and over 2,000 tons to no less than 9 per cent. Mass influences this action in two ways :—

(*a.*) The larger the cargo the more non-conducting material will there be between the spot at which heating is taking place and the cooling influence of the outer air.

(*b.*) The larger the cargo the greater will be the breaking-down action of the impact of coal coming down the shoot upon the portions first loaded into the ship, and the larger thereby the fresh surface exposed to the action of the air.

(2.) The ports to which shipments are made—26,631 shipments to European ports in 1873—resulting only in 10 casualties, whilst 4,485 shipments to Asia, Africa, and America gave no less than 60. This startling result is partly due to the length of time the cargo is in the vessel, the absorption and oxidation being a comparatively long action, but a far more active cause is the increase of temperature in the tropics which converts a slow action into a rapid one.

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(3.) The kind of coal of which the cargo consists, some coals being especially liable to spontaneous heating and ignition. There is great diversity of opinion on this point, but it is pretty generally admitted that cases of heating and ignition are more frequent in coals shipped from East Coast ports than in South Wales shipments. So much, however, depends upon the quantity of small coal present, that a well loaded cargo of any coal would be safer than a cargo of Welsh steam coal in which a quantity of dust had been produced during loading.

(4.) The size of the coal, small coal being much more liable to spontaneous ignition than large. This is due to the increase of active absorbent surface exposed to the air, a fact which is verified by the experience of large consumers of coal on land; gas managers recognising the fact that coal which has been stamped down or shaken down during storage, is more liable to heat than if it has been more tenderly handled, the extra breakage causing the extra risk.

(5.) Shipping coal rich in pyrites (or *brasses*) whilst wet. The effect of external wetting on coal is to retard at first the absorption of oxygen, and so to check the action; but it also increases the rate of oxidation of the pyrites, and they, when oxidised, split into pieces, and this increases the crumbling and heating due to the exposure of fresh dry surfaces.

(6.) Ventilation of the cargo. For ventilation to do any good, cool air would have to sweep continuously and freely through every part of the cargo, a condition impossible to attain,—whilst anything short of that only increases the danger,—the ordinary methods of ventilation supplying just about the right amount of air to create the maximum amount of heating. The reason of this is clear. A steam coal absorbs about twice its own volume of oxygen, and takes about ten days to do it under favourable conditions, and it is this oxygen which, in the next phase of the action, enters into chemical combination and causes the serious heating. Ventilation such as has been sometimes arranged for by a box shaft along the keelson with Venetian lattice upshafts, supplies about as much air as is necessary to produce the results which end in spontaneous ignition.

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(7.) Rise in temperature in steam-colliers due to the introduction of triple-expansion engines and high-pressure boilers. The increase in stokehold temperature due to this is from five to ten degrees Fahr., and this affects the temperature of the adjacent parts of the vessel. Particulars given of the temperature of stokehold and bunkers of H.M.S. *Crocodile* show that while the stokehold temperature was moderate, that of the bunkers did not differ greatly from it, but when the stokehold became heated to 100° Fahr., action commenced in the bunkers, and this rapidly raised their temperature higher than that of the stokehold.

Having thus discussed the chemical and physical conditions which lead to spontaneous ignition, Professor Lewes proceeds to formulate precautions which, in his opinion, will tend to prevent such disasters, as follows :—

(1.) Coal intended for shipment to distant ports should be as large as possible, free from dust, and with as little "smalls" as can be helped. It is better as free from pyrites as possible, in order to prevent disintegration after shipment, *and it should contain when air-dried not more than* 3 *per cent. of moisture;* the quantity of moisture present in an air-dried sample of coal being a sure index to the absorptive power, the higher the amount of moisture held by the coal after exposure for some time to dry air, the greater will be its power of absorption for oxygen, and therefore its liability to spontaneous heating and ignition.

(2.) No coal should be shipped to distant ports until at least a month has elapsed since it was brought to the surface at the pit's mouth. Every precaution should be taken to prevent breaking up of the coal whilst being taken on board, and on no account must any accumulation of fine coal be allowed under the hatchways. When possible, the coal should be shipped dry, as external wet by producing oxidation of the pyrites causes disintegration.

(3.) Precautions to be taken on board coal-laden ships form a phase of the question of the utmost importance. The means adopted should be as nearly automatic as possible, as it is useless to expect the master of a collier during rough weather to comply with any such requirement as daily taking temperatures in various parts of the cargo. The coal compartments should be made gas-

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tight, as far as the bulkheads separating them from the rest of the ship are concerned; and as no difficulty is found in doing this when provision for forced draught is being made, no difficulty should be found in this case. We ask special attention to the next precaution suggested by Professor Lewes, it being, as we shall subsequently see, in direct conflict with the recommendations of the Royal Commission of 1875. He says:—"When the coal has all been taken in, it should be battened down, and the hatches should not be again opened until the vessel reaches her destination, the only ventilation allowable being a two-inch pipe just inserted into the crown of each coal compartment, and led 12 ft. up the nearest mast, the top being left open. This would be quite sufficient to allow free egress to any gases evolved by the coals, but would not allow undue excess of air." In place of the ordinary test tubes and instructions to the master to test the temperature in the body of the coal by a thermometer, Professor Lewes recommends that at regular intervals of 6 ft. iron pipes closed at the bottom should be screwed into the body of the coal cargo. Each tube would have in it a thermometer so arranged that when the coal near it had risen to a certain temperature, it would ring an electric bell in the captain's cabin, and the bell would continue ringing while the temperature was exceeded. He also proposes a method for the extinction of fire by means of carbonic acid gas. The Royal Commission considered a proposal for using carbonic acid for this purpose, and reported against it, considering that water and steam were much more effective for the purpose. Professor Lewes, however, proposes to use liquid carbonic acid compressed under a pressure of 36 atmospheres at a temperature of 32° Fahr. This is used frequently at the present time in connection with freezing machines, and also in the manufacture of aërated waters, &c., and is usually contained in steel vessels with screw valves. On opening the valve, some of the liquid is ejected into the air, and is converted into a large volume of gas, such conversion being attended with a rapid fall of temperature in everything near it. It is upon these two features that the proposal depends, the rapid generation of large volumes of a gas which will not support combustion and the accompanying cooling effect. Professor Lewes

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proposes that steel cylinders, containing liquid carbonic acid, should be placed at intervals among the coals, and that the screw nose-piece of each vessel should be made of a metal which would melt at a temperature of 200° Fahr., and thus liberate the carbonic acid. The vessels containing the acid would be cylinders—each 1 foot long and 3 inches in diameter, and he calculates that there should be one put in for every eight tons of coal. Although, as he says, the liquid can now be obtained at a cheap rate, we should think that the provision of 200 cylinders of it in a ship of 1,000 tons would be a very serious item.

With this system of closing up coal-holds it would be necessary to take precautions upon the arrival of the ship at her destination. On removing the hatches no naked light must be allowed near them, and no one must be allowed to descend into the hold until all the gases have had time to diffuse out into the air. If the cylinders have gone off there will be but little fear of explosion, as a high percentage of the carbonic acid gas lowers the explosive power which the mixture of marsh gas (given off from some coals) and air possess; but the carbonic acid gas would overcome and suffocate a man descending into an atmosphere containing any considerable percentage of it. When a safety-lamp, lowered into the hold, continues to burn as brightly as it did in the open air, then it is perfectly safe to descend.

Water, Professor Lewes goes on to say, is of comparatively little use as an extinguisher when once a cargo of coal is on fire, the fire being, as a rule, near the bottom of the mass of coal, and the flow of water so impeded that in percolating through the heated coal it is converted into steam before it can reach the fire. The most effective way to apply water would be to have four 3-inch pipes laid along the floor of the coal compartments about 6 ft. apart, these tubes having a ¼-in. hole drilled in the upper side every foot or so, and each pair of pipes coming through the bulkhead, and connecting on to two 6-in. pipes passing through the side of the vessel, the sea-water being prevented from entering by means of screw valves. As soon as the alarm-thermometer gave notice that heating had reached a dangerous point, these valves could be opened, and the lower part of the cargo drenched with salt water. This,

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evaporating rapidly, would give large volumes of water vapour which, passing up through the heated coal, would lower its temperature.

Having thus placed before our readers the conclusions arrived at by Professor Lewes, it may be desirable before proceeding to comment upon them, to quote the summary of the recommendations of the Royal Commissioners of 1876, given in their report, as follows :—

"1. That certain descriptions of coal are intrinsically dangerous for shipment on long voyages.

"2. That the breakage of coal in its transport from the pit to the ship's hold, the shipment of pyritic coal in a wet condition, and *especially ventilation through the body of coal cargoes*, conduce to spontaneous combustion, even though the coal may not be unfit for conveyance on long voyages.

"3. That spontaneous combustion in coal cargoes would be less frequent if regard were had by shipowners and underwriters to these facts.

"4. That when coal is being carried on long voyages the temperature in the various portions of the cargo should be tested periodically by thermometer, and registered in the log.

"5. That with a view to guard against explosion, free and continuous egress to the open air, independently of the hatchways, should be provided for the explosive gases by means of a system of *surface* ventilation, which would be effective in all circumstances of weather.

"6. That in order to make known the descriptions of coal liable to combustion, the Inspectors of Mines should be instructed to hold enquiry into all cases of spontaneous combustion occurring in cargoes of coal taken from their respective districts; exporters being required always to record on their specifications the denomination of the coals forming the cargo.

"7. That no additional legislation with reference to the conveyance of coal by sea is required, unless for the purpose of giving effect to our proposals with regard to the enquiries by Inspectors of Mines, and to the fuller specification of coal entered outward at Her Majesty's Customs."

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Taking these recommendations in detail, and turning to the full text of the report with regard to the first, it would appear that the Commissioners themselves recognised the difficulty of defining the descriptions of coal intrinsically dangerous for shipment on long voyages. There would appear to be three distinct causes of danger in the coal itself. They are, first, the presence in considerable quantities of iron pyrites; second, the capacity of the coal for absorption of oxygen gas from the atmosphere; and third, the mechanical condition of the coal, that is, the quantity of small in it. Neither the paper written by Professors Abel and Dr. Percy for the Royal Commission of 1876, nor Professor Lewes's paper give much practical information upon the danger due to pyrites. The first tells us that pyrites in some form are of almost universal occurrence in coal, but that some forms of them do not contribute to the danger of fire; the second seems rather to indicate that too much importance has been attached to pyrites, and that there is little danger due to their presence unless they are wetted. In regard to the capacity of coal for absorption of oxygen gas, Professor Lewes does give a definite criterion of the character fit for shipment:—It should contain, when air-dried, not more than 3 per cent. of moisture. The Royal Commissioners recommended strongly enquiries by Inspectors of Mines as to the descriptions of coal which had been found to be liable to spontaneous combustion. Fourteen years have now elapsed since their report, and it would appear to be time that the reports of the enquiries which have doubtless been made should be tabulated and published. The only practicable way of preventing the shipment of intrinsically dangerous coal is for a list of such coal to be made public, in order that shippers, shipowners, and underwriters may know what they are about in dealing with it. In order for any such conclusions to be valuable, however, the cases should be separated of coal intrinsically dangerous, because of its special characteristics, and coal dangerous because of the quantity of *smalls*. That the latter is a great danger, there can be no doubt whatever,—probably it constitutes the chief danger, and it must be remembered that the danger of the presence of large masses of small coal does not depend upon its being wet. If there are large

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quantities of *brasses* with it then wet materially increases the danger, but if not it may be as bad or worse shipped dry, because dry coal has the larger capacity for absorbing oxygen gas. Great improvements have been made of late years in shipping coal, but even more attention might with advantage be paid to this point. While all systems of loading which cause breakage are bad, those are especially bad which bring about the massing of small coal under the hatchways.

Coming next to the question of ventilation *through* cargoes, it may be stated that the effect of the report of the Commission has been practically to put a stop to the practice, at least so far as regard ships laden in England. Considerable expense was in former times incurred in this kind of ventilation, which was conclusively proved to be a source of danger, and yet was nevertheless demanded by some exporters as a condition of shipment. On one occasion, at Liverpool, the Board of Trade intervened, and either detained or threatened to detain as unseaworthy a vessel having the old arrangements for through ventilation, that is, a trunk on each side of the keelson and latticed upright shafts through the coal under the hatchways. Since that, special arrangements for through ventilation have disappeared. Through ventilation of coal cargoes by means of the masts has, however, been proved to be productive of mischief since that time, and may in many cases have led to spontaneous ignition, and have increased the combustion when once it has began. Evidence given in an official enquiry on the loss of the *Æthelstane* by fire in October, 1887, furnishes a proof of this. In her case, flames were seen issuing from the heads of the fore and main masts, and it was stated that the masts were perforated in many places below the deck for ventilating purposes. It is desirable then that in every shipment of coals for distant ports care should be taken that the mast may not act as a through ventilator.

The Royal Commissioners recommended that when coal is carried on long voyages, the temperature should be tested and recorded in the log from time to time. For this purpose it is necessary that a number of iron tubes, whose upper end should be accessible, should be inserted in the body of the cargo. At least

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there should be such a tube in each hatchway, because there small coal is especially liable to accumulate in loading, and the lower ends of all such tubes should be closed to prevent their acting as through ventilators. Masters and officers of ships have been censured by courts of inquiry, and in some cases their certificates have been suspended, because they did not take pains to ascertain and record the temperature. Whether any such elaborate automatic method as that proposed by Professor Lewes is ever likely to be adopted is, however, very doubtful. Tubes through the cargo at intervals of six feet, electric communication from each of them to bells in the captain's cabin, and hundreds of iron bottles of liquid carbonic acid distributed through the cargo, represent an elaborate system of precaution that is hardly likely to be adopted by ship-owners, who have not only to guard against coal fires but also to make their ships pay. An arrangement by which water could be applied at the lower part of a cargo instead of above, where it is practically useless, stands a somewhat better chance of adoption. In considering provision for putting out fires, however, one must not leave out of the account the character of the ships in which they usually occur. The chief cases of fires in coal cargoes occur in cases of long voyages, that is in large sailing-ships. Not many such ships have more than the collision bulkhead, and of these but few have more than one bulkhead aft in addition.* Consequently any arrangement for the admission of water in large quantities into the body of the cargo would have to be used with the utmost caution, and only after pretty exact knowledge of the locality of the fire. Other vessels liable to spontaneous combustion of coal are steamers in which the coal in the bunkers or in their neighbourhood is rendered liable to ignition by the heat of the stokehold, in addition to heat generated within its own mass by chemical causes. In these cases it would be comparatively easy to make some such provision as indicated by Professor Lewes, and it may be added

* In the Appendix to the Report of the Committee of the House of Commons, in 1887, on Saving Life at Sea, a list is given of sailing-ships described in Lloyd's Register as having more than two bulkheads. There were twenty-three vessels with three bulkheads, twenty-four with four, three with five bulkheads, and one with six.

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that accidents due to spontaneous ignition of bunker coal are likely to increase, not only because of the increased heat of the stokeholds, due to the use of steam at high pressure, but also to the other recent developments in trade. Thus in the Australasian dead meat trade, a vessel leaves, say New Zealand, fully laden with a cargo of dead meat. When full of such a cargo she is flying light and, consequently, the bunkers being filled, she takes a large quantity of coal on deck to avoid having to call at a coal port on her way home. She will have got nearly to Cape Horn before it will have been possible to find room in the bunkers for all the deck load of coal, and consequently when the coal is transferred to the bunkers it is likely to be in a thoroughly wet condition. Whether Australian or New Zealand coal contains pyrites in large quantity we do not know, but every shipmaster who has taken it in knows that he often gets large quantities of *smalls*. There are then present some of the causes which lead to spontaneous ignition, and the ship now has to pass through the tropics where the stokehold heat will be intensified. Cases of spontaneous ignition in this trade are on the increase. In one case we heard of lately where the fire was got under with great difficulty, the danger was intensified from the fact that the burning coal was only separated by a wooden bulkhead from a compartment containing meat. In the discussion which followed the reading of Professor Lewes's paper, one speaker mentioned the fact that some steamers of the Anchor Line have the bulkheads between the stokehold and coal bunkers double, with a freely ventilated air space between. Whether this plan could be generally adopted with advantage or not, it should certainly be possible to so arrange matters that it would be practicable to flood any space containing bunker coal.

We come finally to the question of the surface ventilation of coal cargoes with a view to the removal of the explosive gas which is often given out from newly won coal. On this point Mr. Lewes is in direct conflict with the Royal Commissioners of 1876. In accordance with their recommendation (the fifth of those quoted above), the Board of Trade have frequently, during the last twelve or fourteen years, detained as unseaworthy vessels coal-laden and about to proceed to sea without special provision for surface

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ventilation. Further, it having been the case that in some instances flimsy wooden or cast iron ventilators were fitted in order to supply surface ventilation, and their demolition or disturbance by heavy seas in bad weather, thus exposing unprotected holes in the deck or hatches, having proved a source of danger, the Board issued a detailed description of the construction of such ventilators as they considered were strong enough for the purpose. The shipowner then in loading coal from a British port no longer has the matter in his own hands, but at the risk of having his ship stopped, he must provide for surface ventilation. In fact, it may be said that the chief practical effects of the Royal Commission of 1876 up to the present time have been the discontinuance of the old system of through ventilation of coal cargoes and the universal adoption of surface ventilation. Now it is obvious that surface ventilation must in many cases promote the spontaneous ignition of coal cargoes. By its means the air in the hold above the cargo is being constantly changed, some of the fresh air must find its way amongst the cargo, and thus furnish the oxygen by means of which spontaneous ignition is set up. Perhaps it plays an equally important part in supplying air to maintain combustion which has already commenced, but which is not yet so active as to have been observed. The only question about it is, whether it is not necessary to admit the evils of surface ventilation in order to secure the removal of the still greater danger caused by the accumulation of gases above the coal, which are liable on meeting with flame to explode with great violence. Professor Lewes says in effect—close up the coal compartment, so that no fresh air can go in, and provide for the exit of marsh gas as it is given off from the coal by a small pipe from the crown of each coal compartment leading to such a height up the mast that no flame could ever reach the gas. The practicability of this method depends obviously upon whether the holds containing coal *can* be effectually closed up. The most effective system of surface ventilation will not secure safety from explosion if some care is not taken to shut the coal hold off from the habitable parts of the ship, but if there were no ventilation at all, it would be necessary to have every bulkhead and deck opening

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absolutely air-tight, in fact to so close in the coal that the smallest quantity of gas could not escape from it into other parts of the ship. This is absolutely impracticable in a wood ship,—it is also impracticable as regards bunkers, and if it were tried in other cases very great care would require to be exercised in making the necessary arrangements. This is exemplified by the account given in the report of a Court of Inquiry on one of the last cases of serious accidents at sea caused by the explosion of coal gas. The s.s. *Bellingham*, loaded coals at the Tyne on the 4th December, 1888. The cargo was taken almost direct from the seam for shipment. She had ventilators, but they were defective, that at the fore end of the hold was a good cowl ventilator, but the after one had a mushroom top which it was necessary to screw down in bad weather. The hatches were put on as soon as the cargo was on board, and were not taken off until after the accident. Coal gas got from the after hold through a small hatch into the store-room, and thence to the saloon where there was a fire. In consequence of this there was at sea, on the 9th December, an explosion by which three of the officers were seriously injured.

It may be remarked in connection with this part of the subject, that the great risk of explosion from coal gas is just after the loading is completed, and for the first few days of the voyage. In one instance only we remember to have heard of an explosion after a longer interval than a week, and that was in the case of a steamer in which the coal compartment had been shut up directly after loading, with no ventilators at all, and opened when in an American port, where a stevedore's lamp ignited the gas which had presumably been shut up during the whole voyage. From these facts may it not be inferred that if there is efficient surface ventilation, and if the hatches have been off in fine weather for any considerable time, after a week or two the need for surface ventilation is over, and, then the ventilators are doing more harm than good? At any rate, there would appear a necessity for further enquiry on this part of the question as well as on others which we have indicated.

The Commission of 1876 avowedly left their work in an incom-'ete condition for want of data. Such of their recommendations as

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were definite and precise have been carried out, and yet spontaneous ignition of coal cargoes is still a common cause of loss. Has the time not come then for a fresh start to be made in the matter, either by the appointment of another commission, or perhaps, better, a committee of experts who will be able to tell us whether the means we are taking to avert one danger are conducive to another equally serious?

TO ADJUST AND RE-ADJUST COMPASSES AT SEA.

IN an iron ship or steamer the combined effect of the sub-permanent magnetism of the *hard* iron, and the transient induced magnetism of the *soft* iron, produces a deviation of the compass on the different points as the ship is turned in azimuth.

Briefly stated, the disturbing forces acting on the compass, resulting from the proximity of iron partly hard, partly soft, and partly in an intermediate condition, are of the following character:—

1. The sub-permanent magnetism of the hard iron causes a semi-circular deviation inversely proportional to the horizontal force of the earth.

2. The transient magnetism induced in the soft iron by the vertical force of the earth causes a semi-circular deviation proportional to the tangent of the dip.

3. The transient magnetism induced in the soft iron by the horizontal force of the earth causes a constant deviation, and also a quadrantal deviation, both independent of the latitude.

The forces here indicated are such as admit of a mechanical correction or compensation by means of magnet bars, and soft iron either in the form of balls or chain; for, since the iron retains the same place relatively to the compass and to the ship, the data for the correction are, not the shape and position of the iron, but its effect on the needle in a certain number of positions of the ship as shown by the disturbed compass.

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Instruments required.—The amount and character of the necessary mechanical correction, and the disposition of the various correctors, may be determined by calculation. In the present instance the method is by the *tentative* process, viz., by means of the dumb card, or by the compass itself, and using a distant object, the magnetic bearing of which is known; or otherwise, time-azimuths of the sun converted into correct magnetic bearings. If the ship be brought up to a buoy, the distant object is the readiest; for a ship in the open the sun's bearings are indispensable: and thus the compass, by the proper appliances, can be adjusted to indicate magnetic courses and bearings.

The magnets, of various lengths if they are to lie on the deck, or all of the same length if to be inserted within the binnacle, should have the N.-seeking end distinctly marked, and the middle of each magnet indicated. Of the soft iron, there should be chain enough to fill the boxes; but if balls be used, their power on the needles should be tested before being taken on board.

As a preparation, if you choose, or if you deem it necessary, you can draw two chalk lines, one fore-and-aft, and the other athwartship, crossing exactly below the centre of compass: the middle of the correcting magnets should lie on these lines.

The mechanical correction of the compass, on the basis of the character of the forces producing the deviation, is divided into three parts, each of which must be separately considered, and in the natural order:—(1) the correction of the semi-circular deviation; (2) the correction of the quadrantal deviation; and (3) the correction of the heeling deviation.

The effect of the hard iron on the compass gives rise to a single disturbing force, which might be approximately corrected by a single magnet, if properly placed; but it is usual, on Sir G. B. Airy's principle, to consider it as two disturbing forces—one acting *fore-and-aft*, and the other acting *athwartship*.

The order in which you must make the corrections of the deviation is as follows:—First take two *adjacent* cardinal points; thus, if you begin at N., you must next take E. or W.; similarly, if you begin at S., you must take E. or W. If you begin at E. (or W.), you must then take N. (or S.). Two adjacent points are

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imperative. Then one or other of the intermediate points, N.E., S.E., S.W. or N.W. as convenient.

The order and method of proceeding are more fully explained as follows:—

(1.) Bring the ship's head to one of the cardinal points *correct magnetic*, say W. or E.; then, if the compass show an error, place the compensating magnet fore-and-aft on port or starboard-side, its middle on the thwartship line with the centre of the compass, N. end aft if compass N. is drawn aft, but N. end forward if compass N. is drawn forward; approach the magnet towards the compass until it points correct magnetic as required.

(2.) Next bring ship's head N. or S. *correct magnetic.* If the compass indicates an error, lay the compensating magnet athwartship, its middle on the fore-and-aft line with the centre of the compass, N. end towards the side (port or starboard) to which compass N. is drawn; approach the magnet towards the compass until it points correct magnetic as required.

NOTE.—*It is advisable to leave about* $1\frac{1}{2}°$ *of the semi-circular deviation uncorrected at the N. and S. points, and about* $\frac{1}{2}°$ *at the E. and W. points, the deviation so left to be westerly if the ship has been swung from left to right, easterly if from right to left.*

(3.) Now bring ship's head on one of the quadrantal points, N.E., S.W., S.E., or N.W. *correct magnetic:* if N.E. or S.W. by ship's compass have easterly deviation, or if S.E. or N.W. have westerly deviation, put soft iron (chain or correctors) on the starboard and port-sides of compass; if the reverse, on the fore-and-aft ends of compass.

NOTE.—*It matters not on which cardinal point you commence; if at N. or S. correct magnetic, you must next go to E. or W., then to a quadrantal point.*

The *magnets compensate the sub-permanent magnetism, and the soft iron correctors compensate the induced magnetism of the ship.*

(4.) For the *heeling error;* if on heeling ship, head being N., the N. end of the needle is drawn to the high side, place a small magnet *vertically*, N. end uppermost, below the centre of the compass, and in such position that the error disappears. If the

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attraction is to the low side the vertical magnet must be placed S. end uppermost.

NOTE.—*The* HEELING *deviation is best corrected through the agency of a dipping needle.*

All that has been here indicated must be determined and rectified through the agency of a *dumb card*, or the *ship's compass with sight vanes.*

By the *use of the dumb card* the determination of the deviation, as the ship is swung round, is a simple operation. Clamp the respective bearings of the distant object (or the sun) from time to time; turn the sight vanes on the object, and the lubber's line will indicate on the dumb card the magnetic direction of the ship's head; with this indication the compasses can be compared, and the necessary corrections made.

If you use the ship's compass, with sight vanes, but no moveable azimuth circle as a dumb card, then carefully proceed as follows:—

Let us suppose that you are to be off the entrance to the Tyne in lat. 55° N. on October 25th, with the sun's declination 12° S., you must previously prepare, from Burdwood's Azimuth Tables, a tabular form as follows, allowing about 20° of W. variation for the conversion of true bearings into magnetic:—

App. Time A. M. H. M.		True Bearings.		Mag. Bearings.
9 40	...	N. 144° E	...	S. 16° E.
9 48	...	146	...	14
9 56	...	148	...	12
10 4	...	150	...	10
10 12	...	152	...	8
10 20	...	154	...	6
10 28	...	156	...	4
10 36	...	158	...	S. 2° E.
10 44	...	160	...	South.

We propose to correct the *E. point first.* Bring the ship's head by compass, say S. 56° E. and test the deviation. At 9h. 40m. the sun bears by compass S. 12° W.; the magnetic bearing by Table

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being S. 16° E., the deviation is consequently 28° W., making the magnetic direction of the ship's head S. 84° E. Place a magnet fore-and-aft on the starboard or port-side of the binnacle—the N.-marked end aft—and such that it shall make the compass read S. 84° E.

Test by sun's bearing again; suppose at 9h. 48m. the sun's bearing by compass is S. 11° E., the magnetic bearing being S. 14° E.; the deviation is now 3° W. on S. 84° E., making ship's head magnetic S. 87° E.: finally move magnet towards the compass to correct 3° of deviation, and the E. point is adjusted, since at 9h. 52m. sun's bearing by compass and magnetic bearing are alike S. 13° E.

Similarly correct the *N. point.* Bring ship's head N. by compass: at 10h. 4m. compass bearing of sun is S. 18° E., and magnetic bearing by table S. 10° E., giving deviation 8° E. on compass North. Place a magnet athwartship, before or abaft the compass, N.-marked end to starboard, to correct 7° or 8°. Test by sun's bearing again: at 10h. 12m. sun bears by compass S. 8° E., which, by table, is also the magnetic bearing of the sun: hence the N. point of the compass is correct magnetic.

Lastly, bring ship's head N. 40 E.; at 10h. 20m. table gives sun's magnetic bearing S. 6° E., compass gives S. 12° E., or 6° E. deviation; place soft iron correctors on starboard and port-sides of binnacle to correct 5° or 6°, possibly making the compass magnetic at N.E.; but test it by bearings.

In placing the soft iron correctors, be careful that the compass card moves in the plane of the central line of each corrector.

Having read this part carefully you will now see how to make any other necessary corrections; you must then swing ship round for any residual deviations in the other quadrants, and tabulate these for use, as required.

Thus far no reference has been made to the *Flinder's Bar.* It has already been stated that the magnets are for the purpose of correcting *two* disturbing forces; but, as a fact, there are *three* disturbing forces; one acting *fore-and-aft*, one acting *athwartship*, and a third acting *vertically.* The *fore-and-aft* magnet will, for a given locality, correct the first and last; but on change of

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geographical position the vertical force alters, and therefore the E. and W. points may be over or under corrected. Hence the utility of the Flinder's bar. You may not make the correction exactly perfect on the first attempt, but it is always safe, on finding a large E. deviation on the W. point of the compass, or a large W. deviation on the E. point, to place a vertical bar of soft iron in front of the compass, such that it shall correct from a third to half the deviation on the E. and W. points, and for the remainder of the deviation correct by the fore-and-aft magnet. After the ship has been to the Equator, and especially if she has remained in a low latitude two or three months, the exact amount of Flinder's bar may be determined, and a better correction made.

Practical Rules for the correction of the semi-circular deviation at sea when the compass has been previously corrected by magnets.—If in the lapse of time, or through any considerable change of magnetic latitude, it is found that the deviation card no longer correctly indicates the deviation, you can correct the semi-circular deviation by attending to the following rules :—By *Time Azimuths, or bearings of distant terrestrial objects* bring the ship's head to any of the cardinal points, *correct magnetic ;* then you must move the magnets as required, and on the basis already indicated, for two *adjacent* cardinal points, and subsequently test the correction for the remaining two cardinal points; and then bring the ship round to the other points, for a deviation table.

I. For ship's head brought *correct magnetic* North or South, the correcting magnet lies athwartship, with its N.-marked (*red*) end to starboard or port, according to the original deviation. Then proceed to move the correcting magnet as follows :—

(*a*) *Thwartship magnet with N.-marked end to starboard*—

Ship's head N., with E. dev. (*i.e.* compass N. to starboard) move magnet nearer.

,, ,, ,, W. dev. (*i.e.* compass N. to port) move magnet further off.

Ship's head S., with E. dev. (*i.e.* compass S. to starboard) move magnet further off.

,, ,, ,, W. dev. (*i.e.* compass S. to port) move magnet nearer.

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(*b*) *Thwartship magnet with N.-marked end to port*—

Ship's head N., with E. dev. (*i.e.* compass N. to starboard) move magnet further off.

,, ,, ,, W. dev. (*i.e.* compass N. to port) move magnet nearer.

Ship's head S., with E. dev. (*i.e.* compass S. to starboard) move magnet nearer.

,, ,, ,, W. dev. (*i.e.* compass S. to port) move magnet further off.

II. For ship's head brought *correct magnetic* East or West, the correcting magnet lies fore-and-aft, with its N.-marked (*red*) end aft or forward, according to the original deviation. Then, proceed as follows :—

(*c*) *Fore-and-aft magnet with N.-marked end aft*—

Ship's head E., with E. dev. (*i.e.* compass E. to starboard) move magnet further off.

,, ,, ,, W. dev. (*i.e.* compass E. to port) move magnet nearer.

Ship's head W., with E. dev. (*i.e.* compass W. to starboard) move magnet nearer.

,, ,, ,, W. dev. (*i.e.* compass W. to port) move magnet further off.

(*d*) *Fore-and-aft magnet with N.-marked end forward*—

Ship's head E., with E. dev. (*i.e.* compass E. to starboard) move magnet nearer.

,, ,, ,, W. dev. (*i.e.* compass E. to port) move magnet further off.

Ship's head W., with E. dev. (*i.e.* compass W. to starboard) move magnet further off.

,, ,, ,, W. dev. (*i.e*, compass W. to port) move magnet nearer.

It is to be hoped I have made the subject of adjusting and re-adjusting compasses intelligible in this brief space.

W. H. R.

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SAILING-SHIPS.

IT was not infrequently predicted that the building of sailing-ships would cease in the event of the projected Suez Canal being brought to a successful termination, and that these most noble specimens of man's power over natural phenomena, which walked the waters like animated beings, would soon be as extinct as the Dodo. The prophets based their sapient utterances on the purely gratuitous supposition that the trade from the East Indies, China, Japan, and the Antipodes would be diverted from the sailing-ships following the old route around the Cape of Good Hope, and attracted to the steamships using the shorter route up the Red Sea. Shareholders in sailing-ships made haste to dispose of their depreciated investments, and to transfer their allegiance to steam. Sailing-ship shares consequently fell lower than they had ever before been. Everyone did not share the belief of Robert Stephenson that the proposed water-way would prove to be a stagnant ditch, which would cost so much to dig and to keep in working order that it could never be remunerative. The instinct of the traders, however, was not entirely at fault; even though they raised many objections to it in the first instance when de Lesseps worked hard to enlist their sympathies and entice their capital in order to make his brilliant conception an established fact. Palatial ocean liners and humble ocean tramps have availed themselves of this short cut in increasing numbers, and still the sailing-ship's extended pinions are to be seen on every sea. Within three years from the date of the rush for shares in steamships, there was a radical change for the better for the owners of sailing-ships. Sailers having a registered tonnage varying between 1,500 and 2,000 tons were building at about £20 per ton, which was more than three times the figure at which the highest class ships changed hands in 1870. It would appear that steam has not caused such a sensible diminution in the number of sailing-ships in existence as might justifiably have been assumed. It has, however, somewhat determined the size of the sailing-ship of the future. There are sailing-ships afloat to-day which a few years ago would have been

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considered too unwieldy to be handled under canvas. Fifty years ago there were only about 150 sailing-ships in the British Mercantile Marine over 500 tons register. Even the smallest craft of that time were far in advance of the ships in which the hardy Vikings did or died. One of these ancient vessels, unearthed in Norway in 1880, was 72 ft. long, 17 ft. beam, and probably drew 5 ft. of water. She had twenty benches for rowers, a step for a mast to be shipped at will, and it was evident that she was unable to do anything against adverse gales. The old *Brotherly Love*, in which the illustrious circumnavigator, Captain Cook, is said to have sailed, is an example of the well-built craft of the last century. She was launched in 1764, and sank, after collision, in 1878, at the good old age of 114 years. A model of her has recently been exhibited. Last year was the Jubilee of George Smith's City Line, and Mr. Smith, speaking at a dinner held in honour of the event, pointed out that his firm had owned 52 sailing-ships during the past 50 years, with a tonnage of 49,000 tons, or rather less than 1,000 tons each ship on the average. The favourite size of sailing-ship has gradually increased from 1,000 tons in 1860, to 1,300 in 1870; 2,000 in 1880; and now there are about 20 ships in existence of over 2,500 tons, and some of them over 3,000 tons register! Shipowners and brokers evince an apparently pronounced preference for such leviathans, but underwriters have not yet been educated up to them, and are not very loud in praise of the increased risk consequent on this new departure. The 3,000 ton sailing-ships would appear to be suitable only for certain trades, and in many ports the dock accommodation would be quite inadequate for their requirements in case of damage to their hulls below the water-line. The supplanting of wood by iron has been beneficial to this country. It was, however, a work of time, and many deep-rooted prejudices had to be extirpated. A chief constructor at one of the Royal Naval dockyards is reported to have said to Scott Russell, "Don't talk to me about iron ships, it is contrary to nature." In 1838 the historical steamships the *Sirius* and the *Great Western* were built; and their passage across the North Atlantic utterly falsified the prediction of that man of many titles and much learning, Dr. Lardner. He was of opinion that it would be as easy to make

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a voyage to the moon as across to the United States in a new-fangled steamship. It is always awkward to prophesy before you know. The first sea-going iron sailing-ship was launched that same year, and appropriately named the *Ironsides*. Even after the seaworthiness of iron ships had been proved up to the hilt, there still remained to be wrestled with the important error introduced into the direction of the compass needle by the local attraction and repulsion exerted upon it by the enormous mass of iron in the ship's hull. The deviation of the compass varying with every direction of the iron ship's head, with her degree of heel, and with her geographical position, seemed an insurmountable barrier in the way of iron shipbuilding. Suitable means were devised for correcting this insidious error, and its laws subjected to rigid mathematical analysis. Seamen are greatly indebted to Sir G. B. Airy, who not only made easy the working of the longitude by lunar distances, but also corrected the compasses of the *Ironsides*, and cleared away the tangle for future investigators. Iron appears likely in turn to be superseded by steel, which is much lighter. For example, the steel steamship *Servia* would have weighed 600 tons more if constructed of iron on the same lines.

Of late years it seems to have been the good fortune of the British nation to be shipbuilders to the world at large. Should a yacht of unusual form and dimensions be required for a Russian potentate, a transatlantic steamship for a German company, or an immense sailing-ship for French shipowners, it is generally this country that builds them. Our second-hand sailing-ships are also greedily bought up by foreigners. Scandinavians are the principal customers for wooden ships that have nearly run off their class, but may under their flag be useful yet for the coal and timber trades. Germans prefer our iron ships, which are not much the worse for wear, in order to employ them in the East India and China trades. United States shipowners would gladly purchase iron ships from us, but the protection system of their country does not permit them to buy in the cheapest market. We have seen at Liverpool several well modelled large iron ships that were built in the United States, but wooden vessels are still the principal output of North American shipyards. Such

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wooden ships cannot compete on favourable terms with more modern iron ships, and obtain less rates of freight in their own home ports, such as New York and San Francisco. The period when the fastest sailing-ships were built in the United States is not very remote. The late James Baines, of the well-known Liverpool Black Ball Australian Line, had the *Lightning* built by Donald McKay, at Boston, U.S., and she was able to show a clean pair of heels to any ship on her route. The designers of American clipper ships were not handicapped by tonnage laws such as were in force over here up to the year 1854, and which led to the building of deep, narrow, ships that were unable to keep the sea from want of stability and other inherent vicious qualities. The old builders' measurement was essentially a rule of thumb based upon the length and breadth of a ship. It was obtained by the equation :—Tonnage = (Length − $\frac{3}{5}$ Length) + Breadth + $\frac{1}{2}$ Breadth ÷ 94, where it was erroneously assumed that the depth was as a rule equal to half the breadth. Shipowners not unnaturally wished for ships with large cargo carrying capacities, and small nominal tonnage on which to pay dues, and shipbuilders perforce obeyed their behests. The advent of the American clipper was for a time disastrous to the British shipowning interest, for these splendid ships, with their lofty spars, enormous spread of canvas, and exceptional speed, obtained an almost absolute monopoly of the China tea trade to this country to the exclusion of our own ships. The order of events is entirely reversed now, and American authorities complain bitterly that, with the exception of their protected coasting trade, their ocean carrying trade is in the hands of foreigners. General J. S. Nagley, speaking at the Eighteenth Annual Convention of the United States National Board of Steam Navigation, bewailed the fact that all the resources of their country did not secure to them a rightful share of the world's commerce, inasmuch as other nations perform their carrying trade, and regulate and control their mail facilities. He urged that this issue was one of far reaching importance, and appealed to the pride and material interests of all classes of Americans. Shipowners and shipbuilders bestirred themselves, and British sailing-ships were soon afloat to wrest the palm from the American intruders as they were called. So much was the

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form of these Yankee clippers admired, that the Admiralty sent down draughtsmen to take off the lines of two of them, the far-famed *Challenge* and *Oriental*, as they lay in dry dock. In 1850, the British clipper-ship *Stornoway*, of 506 tons, was built and was soon followed by a goodly fleet of similar sailing-ships. The new class of ship was inferior in point of size to the Americans that they were destined to supplant. Until the year 1863 they were built of wood; but afterwards were composite ships. Only one, the *Lord of the Isles*, of 770 tons, built in 1853, was an iron ship. The average tonnage of the British clipper fleet was 800, and only one, the *Oberon*, exceeded 1,000 tons. There is a yarn, dear to old salts, that Messrs. Green built the *Challenger* on purpose to beat the American *Challenge*, and that the British ship was staked against her antagonist. This at least is certain, that the *Challenger* raced home from Anjer against the *Challenge*, and made the passage in 62 days, beating the American clipper by two days. Another remarkable race was that between the *Challenger*, the *Nightingale*, and the *John Bertram*. The backers of the *Challenger* won the stakes amounting to 20,000 dollars. A good example of the composite clipper is the famous *Thermopylæ*, which may often be seen in the East India Dock at the White Star berth of Messrs. Geo. Thompson & Co. This good old ship is the delight of all true lovers of a clipper sailing-ship. She is 940 tons register, 212 ft. long, 36 ft. beam, and 21 ft. depth, and when under all plain sail on a wind, is the embodiment of a sailor's ideal. She made the passage from London to Melbourne in 60 days; and from China to London in 91 days! We saw the *John Bertram* and the *Nightingale* in the Surrey Commercial Docks in 1883, under the Norwegian flag, and the former foundered in 1885, while bound from New York to Europe with petroleum. *Sic transit gloria mundi.*

The Liverpool iron ship *Liverpool*, of 3,330 tons, is the largest sailing-ship in the world. She is 333 ft. long, 48 ft. beam, and 28 ft. depth. Next to her comes the *Palgrave*, a model of which we saw recently at South Kensington, of 3,078 tons. The French ship *Nord* left the Tyne in the beginning of April with 5,000 tons of coal for Valparaiso. She is 318 ft. long, 46 ft. beam,

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29 ft. depth to upper deck, and has a cellular bottom capable of holding 2,000 tons of water ballast. A sister ship, the *Dunkerque*, has been recently completed on the Clyde for the same owners. The Liverpool ship, *Three Brothers*, is the largest British wooden ship afloat. She is 2,936 tons register, and her dimensions are—length, 323 ft.; breadth, 48 ft.; depth, 31; and was built at Boston, U.S., in 1855.

The American wooden ship *Rappahannock*, lately launched, is the largest of her kind afloat. She is 3,053 tons register, 287 ft. long, 49 ft. beam, and can spread 15,000 yards of canvas. Seven hundred and six tons of Virginia oak and 1,200,000 ft. Virginia pine timber were used in her construction. She has four masts, yellow pine decks, and a long poop extending to the mainmast, which is 89 ft. long and 38 ins. diameter. Her foremast is 6 ft. shorter than the main but of the same girth, her main topmast is 58 ft., and main topgallant mast 71 ft. long. Her mainyard is 95 ft., upper and lower main topsail yards 87 ft. each, lower main topgallant yard 70 ft., upper main topgallant yard 64 ft., main royal yard 53 ft., and her main skysail yard, 43 ft. long. Her lower masts are of Georgian pine, her other spars of Oregon pine, and she has an innovation in the shape of a steel bowsprit without jibboom. Double topsail yards were first fitted to the American four-masted sailing-ship *Great Republic*, the then largest ship in the world. The *Royal Charter* was the first British ship to adopt double topsails, without which it would be almost impossible to sail the 3,000 ton sailing-ships of the present day without a large increase in the number of seamen carried. Her mainmast was 75 ft. from deck, masthead 20 ft., main topmast 65 ft., main topgallant mast 32 ft., and main royal mast 24 ft. long. Her main yard was 101 ft., lower topsail yard 92 ft., upper topsail yard 85 ft., topgallant yard 65 ft., and royal yard 50 ft. long. Her spread of canvas was 15,000 yards. Hence it will be seen that the *Royal Charter* was more heavily sparred than the *Rappahannock*, which is said to be the most heavily sparred ship under the Stars and Stripes. The *Lightning* was 2,093 tons register, 245 ft. long, 44 ft. beam, 23 ft. depth, had bulwarks 7½ ft. high, and a full poop of 90 ft. Her mainmast was

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90 ft. long and 38 ins. diameter; her main yard 95 ft. Some idea may be formed of the cargo capacity of the modern sailing-ship when we mention that the *Liverpool* has just arrived at Dundee with nearly 20,000 bales of jute from Calcutta. The *Rappahannock* has taken 125,000 cases of refined petroleum on her maiden voyage from Philadelphia to Japan. The four-masted iron ship *Ellesmere*, of 2,645 tons register, has carried one and a-half million feet of sawn timber from Puget Sound, and almost the same number of gallons of oil from Philadelphia to Calcutta.

Sailing-ships have made some remarkable runs in the Great Southern Ocean. The *Lightning* once came from Melbourne in 63 days. The *James Baines*, another Black Ball ship, in June, 1854, while running her easting down along the parallel of 43° S., ran 420 miles in 24 hours! There is not much to be wondered at in this, for we know that she was run with main skysail set when a fresh gale was blowing, and she passed less well-provided ships going the same way under reefed topsails! Those were the days of moon rakers, sky scrapers, and studding-sails at every yardarm; whereas plain sail only is now the order of the day. She once was going 21 knots with her main skysail set, and had just taken in studding-sails from skysail downwards! The *Red Jacket*, in 1856, ran from 72° E. to 134° E. in 8 days. She averaged 334 knots daily in wicked weather, and one day was iced up forward. Passengers suffered severely from the cold, but the passage had to be made. Green's Blackwall liner, *Melbourne*, Captain R. Marsden, made 5,129 miles in 17 consecutive days, while making her easting. Her best daily runs were 374, 362, and 352 miles. The *Great Republic* crossed the Equator in the North Atlantic in 33° W., only 15 days 19 hours from Sandy Hook, so that large four-masters were well able to make a passage even in those days.

America is the home of fore-and-aft vessels, which attain to extraordinary dimensions despite their many drawbacks. Their lofty lowermasts are very difficult to replace except in home ports, the great hoist of their sails, the size of gaffs and blocks, the slatting of the sails in light winds, the danger of lowering them in a squall, and the heavy head gear on which the masts depend, are all factors not to be lightly despised in handling them safely. American

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wooden four-masted schooners are not uncommon, and they are gradually creeping up in size. There are the *Elliot B. Church*, 1,088 tons register; the *Haroldine*, 1,294 tons register; one of 1,300 tons, another of 1,400 tons register, and a dozen varying between 400 and 1,000 tons. Winslow has just built a five-masted oak fore-and-aft schooner at Taunton, Massachusetts. She has a carrying capacity of 1,800 tons, her length is 265 ft., breadth 50 ft., depth of hold 25 ft. Her movable centre board is 35 ft. long, 7 ins. thick, and drops 14 ft. below the fixed keel. She draws 9 ft. when empty, and 20 ft. when fully laden; has a steam winch to hoist her sails, heave up anchors, and work cargo gear; has a sail area of 7,000 yards, and her masts are all of the same height, the lowermasts being 115 ft., and the topmasts 56 ft. long. It is reported that another five-masted schooner is contemplated, with a carrying capacity of 3,300 tons, which will be the largest fore-and-aft schooner afloat. The United States has one iron three-masted schooner, the *Red Wing*, of 415 tons register; and one iron four-master of 1,600 tons, built at Wilmington, Delaware. She also owns several four-masted wooden square riggers, as the *Ocean King*, of 2,386 tons, and the *Frederick Billings*, of 2,497 tons register. Americans are decidedly of opinion that a well-modelled keel schooner can make as quick a passage as the average square-rigged vessel, and at less cost to her owners; but the large fore-and-aft rigged schooner is peculiar to America, and will probably remain so.

Germany has lately launched some large iron and steel ships from her yards. The 2,800 ton ship *Nereus* was built by the Bremen Shipbuilding Company of German steel. Last September a large steel sailing-ship of similar tonnage was launced at Genoa, being the first of her kind ever built in Italy. At yet, however, the British iron and steel shipbuilders have but little to fear from foreigners.

Space forbids further mention of others of the many large British iron ships having a larger register tonnage than 2,300. We will conclude by noting that the greater number have been built at Liverpool, Southampton, Port Glasgow, and Belfast, in the order of their names; and that the sailing-ship still survives.

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ANOMALIES IN SHIPBUILDING.

FROM the point of view of the skilled naval architect, the art of shipbuilding may hardly seem capable of anything like the revolutionary changes experienced in recent times in connection with some branches of industrial enterprise which are more or less dependent upon the application of strict scientific rules. Perhaps, indeed, it can scarcely be expected that suggestions involving radical alteration in methods and in the application of principles, should originate within any circle of professional expertism. It is from outside the precise boundary of the academical area that there sometimes springs up the crude idea which may ultimately develop into practical and useful effect.

Now, although naval architecture may be regarded as an art of high order and importance, and as being more or less based upon exact scientific theory and knowledge, yet it may be a question if it be not susceptible of greater adaptation than it has hitherto manifested, to the rapidly developing requirements of commerce, and whether, in fact, it does not admit of considerable modification in regard to the ancient lines of its procedure.

While the designing and building of ships are matters which constitute no part of the professional functions of the navigator, yet it is he who has the best opportunity of forming a practical judgment concerning the behaviour of ships at sea. Hence it might ensue in considerable advantage to nautical and commercial enterprise, if ships' captains and officers were to give their special attention to that part of the subject which relates to the stability and form, as well as to the mechanical structure, of ships, and if the results of their observations and experience were made known and discussed.

As to what ought to be the form of a ship's hull is a matter about which there seems to have been little, if any, division of opinion among shipbuilding authorities. In a general sense, the form of the ar sea-going ships of the earliest times appears to be still ied. Apart from any professedly scientific principles, that

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form—namely, the wedge form—seems naturally to suggest itself as the most appropriate, in order that a vessel may always maintain herself in an approximately vertical position under the ever-altering conditions in which she may be placed in traversing the ocean. Whether she is in a great sea-valley—that is to say, in the trough of the sea between two enormous waves, or is being borne up one of the steep slopes of a wave, or, after being carried over the wave's crest, is being borne down into the trough on the other side, it is absolutely essential for her safety that she always retains her stability in the water; and so that by no combination of the forces of the wind and the waves to which she may become exposed, can her tendency so to retain herself be entirely overcome.

That problematical and imaginary fulcrum in a ship's structural constitution, which is deemed her centre of gravity, may, perhaps, be regarded as some infinitesimal point around which an exactly equal weight of material is distributed in every direction, and about which the entire mass of the vessel, including masts, gear, rigging and appurtenances, might be turned by the application of the slightest amount of force. It seems obvious that practically there can be no such point in a ship, for as a vessel's length is considerably greater than her breadth, her structural weight, even apart from her lading, must be vastly greater in the direction of her bows and her stern than in a transverse direction. For theoretical purposes, however, connected with the designing of ships, such a point appears to receive consideration in the calculations of the naval architect. And whether it has existence or not, the total weight of a vessel as she lies in still water must obviously be equally divisible at some plane at or above or below the vessel's plane of floatation. If the so-called centre of gravity may be regarded as situate somewhere in a line which lies in that dividing plane, and centrally along the vessel's length, then it would seem necessary, in order that the vessel may ever have a tendency to maintain an upright or vertical position in all the conditions of the sea to which she is subject, that she should have such a greater weight below that line—that is to say, at the lower part of her hull—than above it, as will more than counterbalance the weight or the power of the winds and the heavy sea-waves whenever they force

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her over in any direction out of a vertical position. To secure that desideratum it would seem requisite, *unless the size of a vessel renders her independent of the waves*, that the form of the hull should be more or less that of the wedge, so that her greatest floating power may be at or near her plane of floatation, and her greatest sinking tendency along the lowest part of the wedge—namely, along the line of the keel. For if there were no such line of greatest sinking influence—if a vessel were of small dimensions and flat-bottomed, as in the case of a London coal-barge for instance, then, in rising or descending upon a wave, her decks would be parallel with her plane of floatation and would accord with the slope of the wave; the leaning over of the vessel from the vertical position would thus become dangerously excessive, and the working of the ship by her crew would be rendered well-nigh impracticable.

The wedge-form at the bows appears also to be that which is deemed the most favourable for the propulsion of the ship *through* the water, the vessel's stem being sharp and sometimes slanted upward, in order that the water to be displaced may be the more readily penetrated and turned aside, and its resistance to the vessel's progress as far as possible minimised.

Such would seem to be the general form which has been given to ships up to the present time, with greater or less modification in the direction of flat-bottomed hulls in cases where large cargo-stowage, rather than great speed, is the most important consideration. But that it should be the only possible, or even the most useful and effectual form for vessels of large size is a matter which seems difficult to imagine. Whatever the shape of the hull, the weight of the water which the vessel displaces is proportionally the same, being, in fact, the weight of the vessel itself. The wedge-form is that which secures for the vessel a greater stability *in the water*—that is to say, in the case of a vessel which is not of sufficiently large dimensions or of strong enough construction to render her independent of the action of the waves, or to enable her to endure the ever-varying strains she may have to sustain in any of the innumerable positions into which she may be thrown by tempestuous violence. Supposing, however, a vessel of ordinary

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type, but of great capacity—one of 6,000 tons, for instance—has a draught, when ballasted and loaded, of 26 or 28 feet, what would be the advantage, if any, in respect of her propulsion if her draught were only one-third of that amount? Would her propelling-power have to overcome the same amount of the water's resistance if her draught were but six or eight feet? In order that her draught might be thus reduced, of course it would be requisite that her internal depth should be proportionately lessened, and her inboard horizontal area very considerably extended. Let it be supposed that to the not very unusual length of upwards of 400 ft. another 100 ft. were added, with greatly more than a proportionate increase to her breadth, and that in place of a wedge-like form, her shape, so far as regards the interior framework, upon which her strength and strain-sustaining capability would depend, were literally that of an oblong rectangular parallelopiped, what would be some of the comparative advantages of such structural conditions? So enormous a flat-bottomed vessel would seem far better calculated to maintain herself in the vertical position in any sea, than would a vessel of the ancient wedge-form type, for, in regard to general stability, it would no longer depend upon her immersion *in the water*, and upon a counterbalancing weight along the line of her keel, but simply upon her power of floatation *upon the water*. Her breadth must be sufficient to counterbalance the effect of any lateral pressure of the waves or the wind, and to prevent her from unduly heeling over on one side or the other. Her condition would be that of a body really floating *upon* the water, instead of that of a deeply-immersed mass; while, concerning propulsion, it would be *over* rather than *through* the water that she would have to be forced. The principles governing her floating capability would, of course, be those of a ship of any form or dimensions, for floating capability would seem to depend upon these elementary circumstances—namely, 1st, in the case of any solid substance, upon its lightness in comparison with water—that is to say, upon its being of less density than water, taking volume for volume, and 2nd, in the case of any "vessel" which is so far inclosed as to prevent the ingress of the water, upon such a quantity of atmospheric air being contained in it as will more than counterpoise the weight

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of the material of which the vessel and its contents are composed.

Now, if a civil engineer were required to produce, according to his own mode of construction and altogether apart from the naval architect's aid, a vessel which should be strong enough to endure any amount of straining force to which it might be subjected by wind and by wave in connection with its own structural weight, and with any weight within her floating capacity it might be desired she should carry, would not his skill be certainly equal to the task? From what is so well known of the civil engineer's ability in connection with the great railway and other enterprises of modern times, may it not be regarded as certain that he could produce a vessel which should remain unstrained even if suspended upon her two ends or upon any one part of the bottom of her hull? If asked concerning the construction of such a vessel, might he not say, "I will first make a huge, rectangular, and oblong skeleton framework, which shall be formed of a sufficient number of longitudinal and transverse girders of iron or steel whose enduring capability in regard to the stress they can bear is a matter within my every-day experience. That framework shall be of well nigh immaculate strength, and it shall be the foundation —and the only foundation—of the marine structure I am required to produce. At its sides and its bottom, of course, there will be iron plating of the proper thickness, and the vessel shall be divided by bulkheads both longitudinally and transversely to secure sufficient floating power in the event of casualty by collision or otherwise. If thought necessary, the vessel may have a cellular or double bottom, and at the end intended for her head additions may be made which shall not only give her a symmetrical and proper nautical aspect, but will be so sloped as to induce the vessel to rise upon the water when under propulsion. Sternwise or elsewhere such additions may also be made as may be desired for the sake of gracefulness of shape. The large horizontal area of the vessel admits of the dead-weight she will have to carry in the form of boilers, machinery and fuel, being favourably and equably distributed, and of the spaces required for stores and for cargo or passengers being advantageously appropriated. The specialities of my common-

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place and prosaic design includes:—(1) the strong independent skeleton framework which is to be the foundation—and the only foundation—of the vessel's anatomy; (2) the securing of stability by means of a greatly increased horizontal area of floating capacity in lieu of depth of immersion; and (3) such an adaptation of the vessel's exterior shape as to conduce to her propulsion being effected *over* the water rather than through it." It does not seem unreasonable to anticipate on behalf of a vessel of such a form and construction that the following would be some of the advantages possessed by her over a vessel of the same cubical contents but of the ancient type—(1) a larger carrying capacity; (2) the probable need of a less amount of fuel for her propulsion; (3) a stability which would be in nowise impaired by the entire absence of cargo, or by the consumption of fuel and stores; (4) the non-necessity of ballast, whether the ship were empty or partly or entirely loaded; and (5) in consequence of her smallness of depth, a greater rapidity of loading and discharge, and the employment of less labour in the performance of those operations. In addition to those seeming advantages would be the greater security of life in the case of collision or other disaster. If run into on either side by another vessel for instance, not only should the strength of her internal framework and her greater breadth lessen the probability of her being deeply cut into and wounded, but her greater power of floatation, and her more numerous bulk-head divisions would be important items in her favour, and, of course, from her greatly reduced draught of water the risk of grounding as well as of striking upon water-covered rocks would be considerably diminished.

Every branch of science may be said to comprise a knowledge of such natural facts as appertain to any specified subject, including with respect to natural organisms in particular an acquaintance with the laws or principles which appear to govern their structural conformation. As to the building up of animals, for instance, it may be taken as certain, for it is plainly observable, that their structure and general mechanism are perfectly adapted to the functions they have to perform. And in designing and carrying into effect a mechanical contrivance for any special purpose, the skilled

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mechanician—the naval architect, for instance—would seemingly be acting upon the strictest scientific principles if he imitated from nature and practically applied the plan of any arrangement or combination of arrangements which was appropriate to the artificial machine, whatever it might be, to which his inventive skill was being devoted.

Some of the crustaceans afford an example of needful adaptation of structural mechanism to the purposes for which it is employed. The functions of those comparatively diminutive creatures include the faculty of swimming *through* the water, and more especially a locomotive power of crawling over the small irregularities of the bed and shores of the sea and of rivers. Their external shell or covering appears to be most completely adapted to the circumstances of their lives. The strength and support of their entire bodily anatomy consists in their hard, but more or less brittle, exterior covering which would be altogether inappropriate if their weight and dimensions were not insignificant. That exterior structure, however, would be quite of an anomalous character supposing the size of the animals were enormous, and if they were subject to circumstances involving constant exposure to the blows of the heaviest waves; and if, too, in such imaginary case, their instincts or intelligence were so defective as to render their navigation unskilful, and to bring them within the uncomfortable probability of violent collision with other creatures of their own ill-adapted crustacean type.

Upon how different a principle the whale and the elephant, the water-fowl and the horse, and all other vertebrate creatures are built up! Though having ribs within which their vital organs are situate, yet their vertebral column is the foundation of the animal's strength. While the outer coating of the crocodile and rhinoceros may be of the greatest utility according to the natural conditions and the habitats of those animals, yet even the backbone of these creatures is the part of their structure whereon all the other portions of their anatomy depend!

Now as regards the anatomy of even the largest ships of our times, the principle of their construction would seem to be more akin to that of crustacean than of vertebrate animals. It is true they have frames or ribs, and those ribs are attached to the

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keel as a kind of vertebral column. They have also their transverse beams, and their diagonal bracings and ties, and other incidental strengthening arrangements. But to some non-professional critics it might seem that the vertical position of the ribs, and the way in which they are brought round from the keel, is not an arrangement which enables a ship to receive at the least disadvantage the shock of the waves, or the impact of sharp-stemmed and enormously heavy ships, while the back-bone of the vessel—if it can be said to possess one at all—is placed just where its strength would appear to be of the least available value for either of those purposes.

According to the general principles upon which it would appear that ships still continue to be built, the strength of a vessel may be said to lie mainly, if not altogether, in its outer casing or shell. It would seem to have no real internal framework in which the strength of the entire fabric should be concentrated, and which would be independent, as an element of strength and rigidity, of the vessel's plating and ribs, at any one or more of its parts—a framework, for example, which would impart the character of unity to the ship as a whole, and so that any serious blow upon any part of the ship's exterior would be received by the ship as one entire mass—that is to say, so that the vessel's capability of resistance would be that of her entire and united strength and weight. Let it be supposed that a ship A, which, with her lading, is of the total weight of ten thousand tons, and that another ship, B, of exactly the same total weight, and which is steaming at 15 knots an hour, runs stem-on into the broadside of A, giving her a right-angled blow. Now as the strength of a beam is only that of its weakest point, so, if the shell of A at any one place is so vulnerable that, notwithstanding the strength of her beams and her decks, she can locally only present a resisting force that is equal to 50 or 100 tons, more or less, to the stem of the striking ship, it is manifest that she is at a vastly greater disadvantage than if the whole of her weight of 10,000 tons were the resistance with which the on-coming vessel would be met. In the latter case the advantage of B over A would be only that of her momentum through the water, but unless the weight and the strength of A *as an entirety* could be presented to the blow, the conditions of the encounter would be vastly enhanced to her

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detriment. Even if B were a smaller vessel than A—one of less than half her total weight, for instance—yet by coming stem-on at a great velocity and with her whole weight in a direction in a line with her keel, that is to say, in a line along which her greatest amount of strength and momentum would lie, she is at an obvious advantage over the other vessel. She crashes her sharp nose through the more or less brittle plating of A; she almost resistlessly forces in such of A's vertical ribs as are near the point of attack, and perhaps inflicts a great wedge-shaped wound half way into the lateral structure of A, leaving behind her by her rapid rebound a ghastly chasm in her sister-crustacean's side, through which the sea-water loses no time in making its way.

That collisions between ships so occur, and with effects more or less of that character, is shown not only by the newspapers in their almost daily narratives of such disasters, but by the fact that they are a very prolific subject of legal dispute, and the question suggests itself whether the fearful loss of life and the vast sacrifice of property which consequently ensues, cannot possibly be mitigated by a better adaptation of the form and structure of ships to the altered exigencies of navigation in these days of enormously developed maritime enterprise. It is a matter which largely affects the pecuniary interests of shipowners, underwriters, and merchants, and wherein, as it would seem, the Naval Architect's science and the shipbuilder's skill might be advantageously engaged, and to which, also, the practical and careful attention of the commanders and officers of ships generally might be very usefully applied.

R. G. M. BROWNE.

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WEATHER SERVICES.

DR. JOHNSON once said "Whenever two Englishmen meet, they begin to talk about the weather, each trying to inform the other of that which they know nothing about." This, although doubtless true in Dr. Johnson's time, and for a long time afterwards, ought hardly now to be applicable to the present state of knowledge on the subject. The study of the weather has become so general, that there is scarcely a country in Europe which has not its Daily Weather Report, and similar reports are now published in India, Japan, and Mexico, as well as in many of our Colonies. Of all the weather services the United States is the most complete, the whole of its vast territory being dotted with meteorological stations, the work of supervision and discussion being carried out by the Signal Service of the United States Army. In addition to the issue of ordinary weather forecasts, storm warnings, and cold-wave warnings, all of which are of growing interest and value, an effort is made to systematically trace all the weather changes which occur over the continent of North America, and also to track the paths of the storms which appear over the North Atlantic, numerous returns being obtained from captains of ocean steamships and sailing-vessels for this especial work. A study is also made of the ocean ice, and its limits are, as nearly as possible, defined for each month. The Hydrographic Office of the United States Navy works in concert with the Signal Office in all matters of special interest to the sailor, and much valuable information is circulated broadcast by the publication and free issue of the "Pilot Chart of the North Atlantic." This chart gives the general steamship routes to and from America, and the routes of sailing-vessels crossing the Equator outward or homeward bound; also the general winds and currents for each month. Icebergs and derelict vessels are shown in position, and the limits of fog areas to the west of the fortieth meridian are also shown. The tracks of all the gales met with on the ocean are given, and a study of these in connection with the varying conditions of the weather experienced on this side of the Atlantic may prove

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of considerable advantage in the extension and improvement of our weather forecasts and storm warnings. An effort is at present being made by the authorities in the United States to obtain as many facts as possible regarding the general ice movement during the present and past seasons, so that some decided steps may be taken with a view to the accurate prediction of the ice movement for each particular season, as indicated by late telegraphic or other reports of ice, winds, and currents, from the coasts of Newfoundland, Labrador, and even Greenland. An endeavour is also being made to induce the Government of Canada to take such steps as they may deem advisable to obtain as thorough a knowledge as possible of the currents in the vicinity of the Gulf of St. Lawrence, on account of their dangerous character during thick weather.

The Report of the Meteorological Council for the year ending March, 1889, which has recently been issued, shows that good work is being done in our own country so far as the study of the weather is concerned. The department concerned with ocean meteorology has been actively engaged on works of especial interest to the sailor. The series of North Atlantic Synchronous weather charts, upon which the Office has been for some time occupied, are now completed, and the Secretary, Mr. Robert H. Scott, has made a preliminary examination of their contents. During the thirteen months over which the charts extend, it is found that there were in all 273 separate storm-areas. Of these, there were 143, or more than one-half, lasted less than five days. The instances of duration of more than ten days were rare, and those lasting more than thirteen days extremely so, and almost entirely confined to the autumn months. Out of 23 disturbances which took their rise in a lower latitude than 35° N., twelve, or more than one-half, possessed sufficient energy to cross the ocean, and produced disturbed weather as they approached our coasts. The marine branch has also been engaged on charts of the Red Sea, charts of barometrical pressure for the Atlantic, Pacific, and Indian Oceans, current charts for the same oceans, charts for the vicinity of Cape Guardafui, and other important work. The Department for Weather Telegraph continues to issue forecasts three times a

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day—at 11 a.m., 8.30 p.m., and 8.30 p.m. The results of a comparison of the forecasts issued at 8.30 p.m. during the year with the weather actually experienced, show that the total success for the whole of the United Kingdom was 83 per cent., the highest rate of success being 86 per cent. in the south and south-west of England, the lowest 77 per cent. in the west of Scotland. The success of the hay harvest forecasts issued during the summer was 84 per cent., which was 4 per cent. below that of the previous year. Storm warnings were issued to 146 stations on the coasts of the United Kingdom, of which 70 were in England, 14 in Wales, 41 in Scotland, 15 in Ireland, 3 in the Isle of Man, and three in the Channel Islands. A comparison shows that 84 per cent. of the warnings issued were justified by subsequent gales or strong winds. The close agreement in the relative success of the different forecasts issued seems to show that the system on which the predictions are based is correct in principle.

In many countries observations are being made at mountain or high level stations; but at present we scarcely seem able to interpret the indications of the different changes experienced, and hitherto the advantage gained has not been commensurate with the cost of maintenance. In France, observations have long been made at Puy-de-Dome and Pic du Midi and much more recently at the summit of the Eiffel Tower. The latter series show that the movement of the air at a distance from the earth's surface is very greatly in excess of that near the ground. In Germany, there are the observations made by Peter Lechner on the peak of the Sonnblick, and in our own country we have the Observatory on Ben Nevis. The Scottish Meteorological Society and promoters of the latter scheme scarcely seem to secure the advantage to meteorology which was forecasted at the outset, and it is doubtful whether there is so much as a single instance in which the minutest observations on the Ben would have given earlier warning of an approaching change than the more westerly stations on our coasts, but possibly some day an important advance may be made in the interpretation of the changes which take place in the higher atmosphere. At present, however, meteorologists are scarcely agreed whether the changes at a considerable elevation

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precede or follow those at the earth's surface. Much advance has however been made during the last quarter of a century in our knowledge of the laws which govern our weather changes, so that there is reasonable hope for further advance in the future.

SKYLIGHTS AND SIDELIGHTS.

SKYLIGHTS.

KYLIGHTS have always formed important adjuncts in sailing and steam-vessels to other light and air provisions, and it is surprising to what a small extent ingenuity has been displayed in making effective departures from ordinary practice. Doubtless, when skylights are small, or when it is considered unadvisable to have opening arrangements, there is not much scope for improvement. In the case, more especially of engine-room skylights, it is, however, different. Here it is an essential requisite that the skylights should be readily and easily opened and closed, so that except when dangerous seas are being shipped, there may be ample passages for the escape of the heated air in the engine-room.

Every day the question of efficiently ventilating the limited space in which the engineers on duty are confined is growing in importance. With the adoption of triple and quadruple-expansion engines the temperature of engine-rooms has been undoubtedly increased, and thus the necessity of a thorough and most effective arrangement of down-cast and up-cast ventilation is abundantly evidenced. For the former purpose, there appears no better provision than large bell-mouthed ordinary ventilators; for the latter, a well arranged skylight. Sometimes the former (down-cast ventilators) are not fitted, and reliance is entirely placed upon the sometimes open, but frequently, and necessarily so, closed engine-room skylight, and the latter constructed with heavy teak wood flaps is usually dangerous to open, and awkward to close. Accidents to engineers and others are not uncommon by the flap suddenly descending, and breakages of hinges, stays, &c., are frequently experienced. The same remarks apply equally to skylights built of iron, and in addition the watertightness of the

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common iron skylights is always highly problematical. Frequently the framing of the openings and of the flaps are of angle bars, and very crude in their construction, in other instances, for so-called economical reasons, common cast-iron frames have been adopted. In few, if any, vessels fitted with ordinary iron skylights are the detailed arrangements satisfactory.

Recently there has been introduced an improved skylight flap with glasses, framing, hinges, quadrant and double external fasteners all complete, known as Mason's patent. As it embodies several important departures, we give three illustrations of it. Figs. 1 and 2 show the skylight open, and Fig. 3 when closed. The

FIG. 1.

FIG. 2.

essential points of difference between these skylights and ordinary ones appear to be, first, that being balanced or pivoted at the centre of the flaps, they are easily opened and closed; secondly that, having the grooves fitted with suitable packing and corresponding projections on the frames and flaps, when closed they are perfectly watertight; thirdly, they are of improved appearance, rendered possible by their being constructed of the most carefully annealed best quality

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of malleable cast iron. Owing to the first of these three-fold features, there is practically no liability to breakage of hinges, and the wear and tear is reduced to a minimum, as there is no straining.

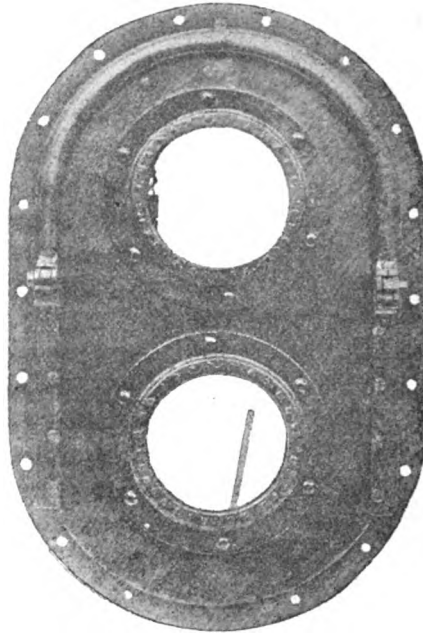

FIG. 3.

The watertight arrangements are an adaptation of the best practice in watertight doors for bulkheads, but in place of india-rubber being used for the packing, owing to its liability to deterioration when subject to heat, an anti-friction packing, suitable for all climates, is fitted. Both the first and third features are apparent from the illustrations.

Each of the Mason skylights is provided with a quadrant and pin, so that they may be opened to any desired angle. The cost is by no means excessive, and we are informed that wherever they have a fair trial they are most likely to receive approbation.

The same invention is claimed as equally applicable to skylights constructed of teak or other hard wood, viz., the pivoting of the flaps and weather-bar arrangement, with corresponding advantages —the facility of opening and closing, immunity from breakage of hinges being very manifest.

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SIDELIGHTS.

In the ventilation of state rooms, saloons, bath-rooms, crew spaces, &c., on board all classes of vessels, the sidelight scuttle is frequently the sole means of obtaining daylight, and often the principal means of ventilation. Ordinary sidelight scuttles are, however, usually difficult to close, so as to be perfectly watertight, and thus grave inconveniences arise. They are also for the same reason dangerous, especially when under the passengers' control; while, on the other hand, if they have locking arrangements not under their charge, the passengers may suffer either from too large or too small a supply of fresh air. In a dead calm, as a means of ventilation, the ordinary sidelight scuttle or square ports, as fitted in Indian, Chinese, and other Eastern trading vessels, are not effective, but experienced sea-goers have, by projecting articles through port-holes, thereby caused an in-draught by their resistance to the forward movement of the vessel. This latter idea has been adopted in Mason's Patent Sidelights, which are also in other respects an advance on ordinary practice. Fig. 1 shows one of Mason's sidelights, suitable for deck-houses not liable to be struck

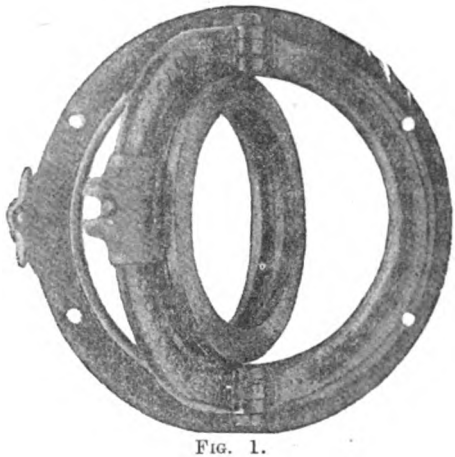

FIG. 1.

with heavy seas, and thus without a dead light. It will be seen the frame containing the glass is pivoted at its centre, so that the labour in closing and screwing tight the scuttle is much less than with ordinary sidelights. On the main and glass frame are pro-

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jections and V-shaped grooves, the latter fitted with suitable packing, making an efficient weather bar arrangements. The projection of the sidelight frame and glass when open, beyond the outside of the vessel is less than half the diameter of the light, and thus there is decreased liability to damage as compared with square ports opening externally and which require lanyards attached to them, and the deck above to keep them open. It is also evident that they are much handier, and can be entirely under the passengers' control, or otherwise, as may be desired.

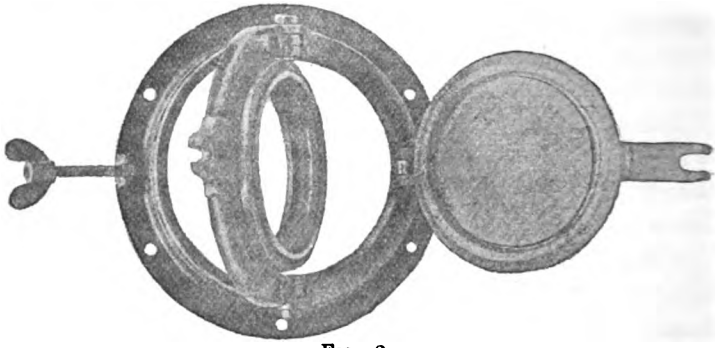

FIG. 2.

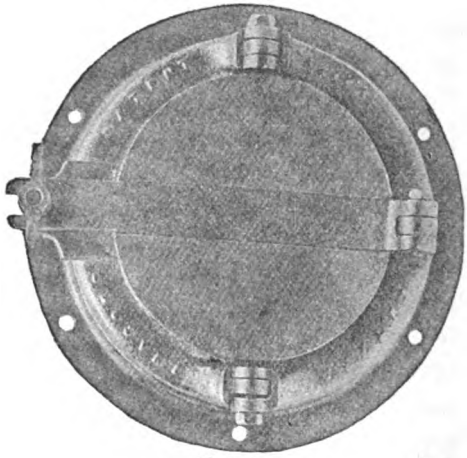

FIG. 3.

Fig. 2 shows one of Mason's sidelights, fitted with a dead-light in the open position, and Fig. 3 the same pattern with light and dead-light closed.

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The sidelights are claimed to be a great improvement upon present practice, and worthy the attention of shipowners; and while in our illustrations they are shown with the pivots of the lights placed vertically, as advisable for tropical climes, yet it is stated that when desired they can be equally as well placed horizontally, which in the North Atlantic and similar trades might be probably found most advantageous, at all events in high speed steamers. Mr. George N. Arnison, Junr., Naval Architect, Ship and Engine Surveyor, Sunderland, is the sole owner of the patent rights in Mason's skylights and sidelights.

CORRESPONDENCE.

THE MARITIME CONFERENCE.

To the Editor of the "Nautical Magazine."

SIR,—I was somewhat surprised to observe that an article in this month's *Nautical Magazine* summarising my paper at the Naval Architects, concluded with the remark that no one agreed with me. I was still more surprised to note that the writer supposed Admiral Bowden-Smith to be in disagreement with me. My own impression of the matter was given in the first words of my reply, in which I said that I had never been present at a discussion on the Rule of the Road, where there was so much agreement. I may be wrong, of course, but Mr. Baden Powell appeared to agree with the principal changes in the law proposed by the Conference, as did Admiral Bowden-Smith, and Captain Wharton, the hydrographer. As I have been, as Admiral Bowden-Smith pointed out, in conference with these officers, and am myself unconscious of any great disagreement with either of them on the principles which should govern the Rule of the Road, or with the chief proposals of the Maritime Conference, I think the writer of your article must be under some misapprehension. I grant that Admiral De Horsey did not accept my positions, but then he appeared to me to be almost alone in his views.

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No doubt my views are pretty well known by this time, but I doubt whether they are as well understood as they are known. I first published them in 1867, not supposing they were new, but believing that the marine, which universally held them thirty years before, had forgotten them and had fallen into errors as to the proper methods of avoiding collisions, which were the chief cause of them.

In saying this, I thought, until the other day, that I was original. But I have picked up a book published at Melbourne in 1860, and written by a Mr. Perry, formerly a master mariner, and afterwards member of the Legislative Council of Victoria, which quite knocks the ground from under my feet. He seems to have done exactly what I did, in going to the study of actual collisions for inspiration; he produces diagrams closely resembling those which I usually employ, and he claims to have discovered thereby "a universal maritime error." This error simply is the habit seamen had got into of *turning away from* the approaching ship with which collision is feared, instead of *turning towards her*. He had not the advantage which I have had of being intimately acquainted with the precise movements which ships make under the action of their helms and variations in their speed, but still, without this, he was able to fasten on the error, and to prove it by diagrams of actual collision cases.

I have said that I think my views are more widely known than understood, and I say this because while they have been generally condemned, a few of our best men have gone over the ground with me, and in every case such agreement has resulted.

Indeed the main parts of my views are not contestable, for they are not matter of opinion at all. They are matters of fact. As that ships move over particular paths when their helms are put over; as that the vast majority of collisions happen when the courses cross at an angle of not more than three points of the compass; as that no collisions happen unless one or both ships attempt to turn away from the other; as to the ship which is farthest from the collision point having—all other things being equal—the greatest power of avoiding collision; as that in cases of close proximity it may be *impossible* for the ship ordered to

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keep out of the way" to do so, but quite easy for the ship ordered to "keep her course" to avoid a collision if she turns towards the other ship. It is this latter point that Mr. Perry dwells on so fully.

None of these things are matters of opinion, and there cannot be controversy about them. If there are any that deny them, they can only be asked to show the contrary—and that is not possible. Disagreement may, and does, arise after admission of the facts, as to the manner in which law and practice should treat them; and here there are unquestionable difficulties. I am satisfied to make law deal with the general case and the enormous majority of instances, leaving the exceptional cases to shift for themselves. I do not see how exceptional cases are to be met without confusing the general case and making it dangerous. Others, however, are unwilling to leave the exceptional cases unprovided for. Absolute reconcilement is here not possible, and we come necessarily to some such compromise as the Maritime Conference has arrived at—a compromise which I am very glad to accept as being certainly in the right direction.

I should teach seamen to-morrow the general maxims:—"Never port to a green light; never starboard to a red light; never turn away from the sound of a fog-signal;" with a conviction that if they acted on them there would be an astonishing diminution in the number of collisions. Others would shrink from giving this advice because here and there—in a very small minority of cases—it would be wrong. But between such men and myself there would certainly be the admission of compromise, and some improvement on the existing conditions would certainly be hatched out.

Your obedient servant,

P. H. COLOMB.

97, St. George's Road, S.W., May 15th, 1890.

ROYAL NAVAL RESERVE UNIFORM.

To the Editor of the "Nautical Magazine."

SIR,—A Committee, under the Chairmanship of the Duke of Edinburgh, has been appointed to enquire into the whole question of naval uniforms, with a view to a permanent settlement of the

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various grievances supposed to exist in connection with the dress of naval officers. This opportunity of obtaining some very necessary alterations in the uniform of the Royal Naval Reserve should not be allowed to pass, and I write this letter in the hope that it may be the means of eliciting some expressions of opinion on this question from Reserve officers, of whom I am sure there is a very large number amongst your readers, and need I say you will put us all under a debt of gratitude by opening the pages of your journal for that purpose. I think we, as seamen, have just grounds for objecting to the change recently made in the uniform of the Royal Naval Artillery Volunteers, who, although landsmen, are now permitted to appear in public in a uniform almost identically the same as that worn by officers of the Royal Naval Reserve. At any rate, the difference is so slight it would require a very close inspection indeed, even by the initiated, to point it out. It is universally admitted—and I have heard very strong expressions of opinion on this point from naval officers—that the Admiralty committed a grave error in substituting gold for the silver lace previously worn by the Royal Naval Artillery Volunteers, and why the privilege of wearing gold lace should be accorded to them and not to other volunteer officers remains a mystery to many; but the mischief has been done, and it now remains for us as seamen to press upon the Admiralty the necessity of giving us a uniform in which we may appear in public without fear of being taken for landsmen masquerading in nautical attire. I would suggest that the present unsightly distinction stripes of wave braid on the sleeves be replaced by lace, and that bullion loops be substituted for the twisted braids on the cocked hat. The device on the epaulettes, buttons and plate for sword-belt would still be sufficiently distinctive for service purposes, and I feel sure our brother seamen of the Royal Navy would not object to the proposed alterations which, if granted, would be extremely gratifying to the majority of Reserve officers. The present Admiral Superintendent of Naval Reserves—Sir George Tryon—is accredited with the praiseworthy desire of improving the dress of the seamen of the Reserve, and I trust he will give his attention to the dress of the officers also, for in the opinion of many, who are in a position to judge, there is

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no one more competent, from large experience and close acquaintance with the traditions and usages of the mercantile marine, to deal with a question of this nature, which touches so closely the professional pride, and rather tender susceptibilities of a large body of British seamen.

I am, &c.,

May 15th, 1890. A NAVAL RESERVE OFFICER.

ICEBERGS.—WARNING BY TEMPERATURE.

To the Editor of the "Nautical Magazine."

Dear Sir,—Much has been said from time to time about detecting the neighbourhood of an iceberg in thick weather by the thermometer.

Let the following observations speak for themselves :—

Noon, April 15, 1890. Lat. 46° 38′ N., long. 41° 8′ W. Weather fine and clear, wind South, force 3 to 4.

Passed 100 yards to windward of an iceberg about 400 ft. square and 60 ft. high.

	Temperature	8 a.m.	air 56°	water 56°
	,,	10 ,,	,, 59°	,, 57°
Iceberg in sight	,,	11 ,,	,, 60°	,, 57°
,, 3′ dist.	,,		,, 60°	,, 57°
,, 1′ ,,	,,		,, 61°	,, 57°
,, 100 yards off	,,	noon	,, 61°	,, 57°
,, 1′ astern	,,		,, 60°	,, 57°
	,,	4 p.m.	,, 58°	,, 57°

Had we been close to leeward we would have found a change in the temperature, but we could have gone end-on into it and had no warning 100 yards off.

The berg was a small one, but large enough to do all the harm one of the largest size could do.

Yours truly, E. W. OWENS,

Boston, Mass., U.S.A., Master, Warren Line s.s. *Iowa*.

22nd April, 1890.

ADMIRALTY CHARTS.

To the Editor of the "Nautical Magazine."

Dear Sir,—I should like to know if you can give me any reason why the Admiralty cannot supply charts when ordered from them, as in nine cases out of ten when Admiralty Charts are

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ordered we are simply told they are under correction or out of print. Now, I think this should not be in that department. They should always have a certain amount on hand. I find during the last three weeks that I have ordered over thirty Admiralty Charts, and not been able to get over ten of them. The Charts wanted are not out of way places, but local. I think if the Admiralty cannot manage this department better than this, it is time they gave up recommending the sale of them and let the London publishers do them, then we should get despatch, which is a thing they do not know. Trusting that this may be the means of moving them, so that when we apply for Charts we will be able to get them,

I am, dear Sir,

Yours truly,

WILLIAM HAKES.

Hull, 17th May, 1890.

[We cannot give our correspondent any reason why he does not get the Charts he asks for, but would suggest he should communicate with the Hydrographic Department of the Admiralty on the subject. Considering how often Wreck Inquiry Courts have advised or urged that Admiralty Charts be used, we think there ought to be no difficulty in the way of their being promptly supplied through the recognised agents to any applicant.—Ed. *N.M.*]

BOOKS RECEIVED.

We are obliged to hold over until next month several Notices of Books, &c., received.

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TIDE TABLES FOR JUNE, 1890.

Also Ports of Reference for the Constants in the next Table.

Week Day.	Month Day.	LONDON BRIDGE. A.M.	LONDON BRIDGE. P.M.	HULL. A.M.	HULL. P.M.	NORTH SHIELDS. A.M.	NORTH SHIELDS. P.M.	LEITH. A.M.	LEITH. P.M.	DEVONPORT. A.M.	DEVONPORT. P.M.	DOVER. A.M.	DOVER. P.M.	WESTON-SUPER-MARE. A.M.	WESTON-SUPER-MARE. P.M.	LIVERPOOL. A.M.	LIVERPOOL. P.M.	GREENOCK. A.M.	GREENOCK. P.M.	QUEENSTOWN. A.M.	QUEENSTOWN. P.M.	KINGSTOWN. A.M.	KINGSTOWN. P.M.	LONDONDERRY. A.M.	LONDONDERRY. P.M.	BREST. A.M.	BREST. P.M.
		H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
S	1	0 8	0 28	4 39	4 59	1 38	1 58	0 34	0 54	3 51	4 14	9 15	9 38	4 53	5 18	9 32	9 52	10 13	10 35	3 6	3 29	9 26	9 47	6 13	6 35	1 57	2 18
M	2	0 49	1 11	5 20	5 41	2 18	2 38	1 15	1 36	4 37	4 59	10 2	10 26	5 43	6 8	10 14	10 37	10 58	11 22	3 52	4 15	10 8	10 28	6 57	7 19	2 40	3 2
Tu	3	1 33	1 53	6 4	6 27	2 59	3 20	1 57	2 18	5 21	5 43	10 50	11 14	6 32	6 56	11 0	11 23	11 46	—	4 38	5 1	10 49	11 10	7 41	8 3	3 24	3 46
W	4	2 15	2 37	6 50	7 13	3 42	4 5	2 39	3 1	6 5	6 27	11 38	—	7 20	7 43	11 46	—	0 10	0 34	5 24	5 48	11 32	11 55	8 24	8 45	4 9	4 32
Th	5	3 0	3 22	7 36	7 59	4 28	4 51	3 23	3 46	6 49	7 11	0 4	0 29	8 6	8 29	0 9	0 32	0 58	1 22	6 12	6 36	—	0 19	9 6	9 28	4 55	5 18
F	6	3 46	4 10	8 23	8 48	5 16	5 42	4 10	4 36	7 34	7 57	0 55	1 22	8 52	9 15	0 56	1 20	1 46	2 10	7 2	7 27	0 44	1 11	9 52	10 17	5 42	6 8
S	7	4 36	5 0	9 14	9 41	6 9	6 37	5 3	5 32	8 20	8 44	1 49	2 17	9 38	10 2	1 45	2 13	2 35	3 1	7 53	8 19	1 38	2 6	10 45	11 16	6 36	7 4
S	8	5 27	5 55	10 9	10 39	7 6	7 37	6 2	6 33	9 9	9 37	2 45	3 14	10 26	10 50	2 40	3 7	3 28	3 56	8 46	9 13	2 36	3 6	11 52	—	7 33	8 2
M	9	6 24	6 54	11 12	11 49	8 10	8 46	7 6	7 41	10 7	10 38	3 43	4 12	11 16	11 45	3 36	4 8	4 24	4 54	9 41	10 10	3 37	4 11	0 31	1 13	8 33	9 5
Tu	10	7 26	7 58	—	0 27	9 24	10 1	8 17	8 53	11 11	11 46	4 41	5 9	—	0 16	4 42	5 17	5 25	5 57	10 41	11 15	4 47	5 21	1 57	2 38	9 38	10 12
W	11	8 31	9 7	1 1	1 33	10 36	11 8	9 29	10 2	—	0 23	5 37	6 6	0 49	1 22	5 54	6 30	6 30	7 3	11 49	—	5 53	6 24	3 13	3 43	10 46	11 21
Th	12	9 42	10 16	2 3	2 32	11 38	—	10 31	11 0	1 0	1 36	7 39	7 8	1 55	2 29	7 4	7 36	7 35	8 7	0 23	0 56	6 53	7 21	4 8	4 32	11 55	—
F	13	10 46	11 17	3 1	3 30	0 7	0 34	11 28	11 53	2 9	2 40	7 39	8 8	3 3	3 35	8 6	8 32	8 37	9 5	1 27	1 56	7 49	8 17	4 55	5 16	0 25	0 53
S	14	11 46	—	3 57	4 22	0 59	1 22	—	0 16	3 9	3 35	8 35	9 0	4 6	4 35	8 56	9 19	9 32	9 58	2 24	2 51	8 44	9 11	5 37	5 59	1 19	1 43
S	15	0 12	0 36	4 46	5 8	1 45	2 7	0 39	1 2	3 59	4 22	9 25	9 49	5 3	5 30	9 41	10 3	10 23	10 46	3 16	3 40	9 36	9 58	6 22	6 45	2 7	2 29
M	16	1 0	1 22	5 30	5 52	2 28	2 49	1 24	1 46	4 44	5 5	10 12	10 35	5 55	6 18	10 24	10 45	11 9	11 32	4 3	4 25	10 18	10 37	7 7	7 29	2 50	3 11
Tu	17	1 44	2 4	6 14	6 35	3 9	3 28	2 7	2 27	5 25	5 45	10 58	11 19	6 40	7 1	11 6	11 26	11 54	—	4 46	5 7	10 56	11 15	7 50	8 9	3 31	3 51
W	18	2 23	2 43	6 55	7 14	3 47	4 6	2 46	3 4	6 3	6 21	11 40	mid.	7 21	7 39	11 46	—	0 14	0 34	5 27	5 46	11 34	11 53	8 26	8 42	4 10	4 28
Th	19	3 1	3 19	7 33	7 51	4 25	4 44	3 21	3 38	6 38	6 54	—	0 20	7 57	8 15	0 5	0 23	0 53	1 12	6 4	6 22	—	0 12	8 58	9 15	4 46	5 4
F	20	3 37	3 55	8 9	8 26	5 2	5 20	3 56	4 14	7 10	7 26	0 40	0 59	8 32	8 48	0 41	0 59	1 30	1 48	6 40	6 58	0 30	0 48	9 32	9 49	5 22	5 39
S	21	4 13	4 31	8 44	9 2	5 38	5 57	4 32	4 50	7 42	7 58	1 18	1 37	9 4	9 21	1 16	1 33	2 6	2 23	7 16	7 34	1 7	1 26	10 6	10 24	5 56	6 14
S	22	4 50	5 8	9 21	9 40	6 16	6 36	5 9	5 30	8 14	8 30	1 57	2 16	9 38	9 55	1 51	2 10	2 41	3 0	7 53	8 12	1 45	2 5	10 43	11 6	6 33	6 54
M	23	5 27	5 47	10 0	10 22	6 57	7 20	5 53	6 16	8 48	9 9	2 37	2 58	10 12	10 29	2 30	2 50	3 20	3 40	8 31	8 51	2 27	2 49	11 32	—	7 17	7 40
Tu	24	6 7	6 30	10 46	11 13	7 44	8 10	6 40	7 6	9 30	9 52	3 19	3 41	10 48	11 9	3 11	3 34	4 1	4 23	9 12	9 34	3 12	3 36	0 1	0 33	8 3	8 26
W	25	6 53	7 18	11 42	—	8 39	9 9	7 34	8 2	10 17	10 44	4 4	4 27	11 32	11 58	4 0	4 27	4 47	5 12	9 57	10 23	4 3	4 32	1 6	1 40	8 51	9 18
Th	26	7 44	8 12	0 12	0 42	9 40	10 12	8 32	9 4	11 13	11 46	4 51	5 17	—	0 27	4 56	5 29	5 39	6 8	10 53	11 24	5 2	5 32	2 15	2 49	9 48	10 21
F	27	8 41	9 14	1 12	1 42	10 43	11 13	9 38	10 8	—	0 23	5 44	6 12	0 57	1 28	6 3	6 37	6 38	7 8	11 55	—	6 1	6 29	3 20	3 48	10 54	11 26
S	28	9 48	10 18	2 10	2 38	11 42	—	10 35	11 2	1 0	1 35	6 41	7 11	2 0	2 32	7 9	7 39	7 39	8 9	0 26	0 57	6 56	7 23	4 13	4 35	11 57	—
S	29	10 47	11 17	3 4	3 33	0 9	0 36	11 29	11 56	2 9	2 40	7 41	8 11	3 4	3 38	8 7	8 34	8 39	9 9	1 28	1 59	7 52	8 21	4 57	5 19	0 27	0 56
M	30	11 47	—	4 0	4 27	1 2	1 27	—	0 21	3 10	3 39	8 39	9 6	4 11	4 42	9 0	9 25	9 37	10 4	2 29	2 57	8 49	9 17	5 41	6 4	1 23	1 49

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TIDAL CONSTANTS

For Various British, Irish, and European Ports.

By applying the Tidal Constant of the place, according to its sign (+ *add* — *sub.*), to the time of high water on the given day at the port of reference, you have the time of high water at the place sought.

Place.	Constant	Port of Reference.
	H. M.	
Aberdeen	−1 17	Leith
Aberystwyth	−3 52	Liverpool
Alderney	+2 59	Brest
Antwerp	+5 18	Dover
Arbroath	−0 42	Leith
Arcachon	+0 50	Brest
Arklow	−2 25	Kingstown
Ayr	−0 18	Greenock
Banff	−1 49	Leith
Bantry harbour	−1 14	Queenstown
Barnstaple bridge	−0 26	Weston-s.-Mare
Bayonne	−0 2	Brest
Beachy head & Rye bay	+0 8	Dover
Beaumaris	−0 51	Liverpool
Belfast	+2 42	Londonderry
Berwick	−1 5	N. Shields
Blyth	−0 8	N. Shields
Bordeaux	+3 3	Brest
Boulogne	+0 13	Dover
Bridport	+0 23	Devonport
Bristol & King Road	+0 19	Weston-s.-Mare
Cadiz	−2 2	Brest
Caernarvon	−1 56	Liverpool
Calais	+0 37	Dover
Campbeliton	−0 28	Greenock
Cardiff	+0 2	Weston-s.-Mare
Cardigan bar	−4 22	Liverpool
Carlingford bar	−0 10	Kingstown
Chatham	−0 47	London
Cherbourg	+4 2	Brest
Coleraine	−1 37	Londonderry
Coquet Road	−0 23	N. Shields
Cordouan Tower	−0 10	Brest
Cowes (West)	−0 27	Dover
Crinan	+4 41	Greenock
Cromarty	−2 21	Leith
Dartmouth	+0 33	Devonport
Deal & Downs	+0 3	Dover
Dieppe	+7 19	Brest
Donaghadee	+0 3	Kingstown
Donegal harbour	+0 17	Queenstown
Douglas & Ramsay	−0 11	Liverpool
Dublin bar	+0 2	Kingstown
Dundalk	−0 16	Kingstown
Dungeness	−0 27	Dover
Dunkerque	+0 56	Dover
Exmouth	+0 38	Devonport
Falmouth	−0 46	Devonport
Fecamp	+6 57	Brest
Ferrol	−0 47	Brest
Flamborough head	−1 59	Hull
Fleetwood	−0 13	Liverpool
Folkestone	−0 5	Dover
Fowey	−0 29	Devonport
Flushing	+1 42	Dover
Galway bay	−0 26	Queenstown
Gibraltar	−1 27	Brest
Glasgow (Port)	+0 10	Greenock
Gloucester	+2 51	Weston-s.-Mare
Granville	+0 26	Brest
Gravesend	−0 48	London
Grimsby (Great)	−0 53	Hull
Guernsey (St. Peter)	+2 50	Brest
Hartlepool	+0 5	N. Shields
Harwich	−1 52	London
Havre	+6 4	Brest
Helgoland	+0 21	Dover
Holyhead	−1 12	Liverpool
Holy Island harbour	−0 53	N. Shields
Honfleur	+5 42	Brest
Inverness	−1 59	Leith

Place.	Constant.	Port of Reference.
	H. M.	
Jersey (St. Helier)	+2 38	Brest
Kinsale	−0 18	Queenstown
Lerwick (Shetland)	−3 47	Leith
Limerick	+1 15	Queenstown
Lisbon Bar	−1 17	Brest
Littlehampton	+0 24	Dover
Llanelly bar	−0 38	Weston-s.-Mare
Lowestoft	−4 1	London
Lynn & Boston Deep	−0 29	Hull
Margate	−2 18	London
Maryport	+0 8	Liverpool
Milford Haven entr.	−0 58	Weston-s.-Mare
Montrose	−0 52	Leith
Morlaix	+1 6	Brest
Needles point	−1 26	Dover
Newcastle	+0 23	N. Shields
Newhaven	+0 39	Dover
Newport	+0 16	Weston-s.-Mare
Nieuport	+1 6	Dover
Nore	−1 28	London
Orfordness	−2 43	London
Oporto	−1 17	Brest
Ostende	+1 13	Dover
Padstow	−1 41	Weston-s.-Mare
Peel, Isle of Man	−0 15	Liverpool
Pembroke Dock	−0 42	Weston-s.-Mare
Penzance	−1 13	Devonport
Peterhead	−1 43	Leith
Piel harbour, Barrow	−0 18	Liverpool
Plymouth breakwater	−0 6	Devonport
Poole	−2 2	Dover
Port Carlisle	+0 47	Liverpool
Portland breakwater	+1 18	Devonport
Port Patrick	−0 58	Greenock
Portsmouth	+0 29	Dover
Ramsgate	−2 19	London
Rotterdam	+4 33	Dover
Santander	−0 17	Brest
Scarborough	+0 48	N. Shields
Selsea bill	+0 33	Dover
Sheerness	−1 21	London
Shoreham	+0 22	Dover
Sligo bay	+0 17	Queenstown
Southampton	−0 42	Dover
Spurn point	−1 8	Hull
St. Ives	−2 10	Weston-s.-Mare
St. Malo	+2 18	Brest
St. Mary (Scilly)	−1 16	Devonport
St. Nazaire	−0 7	Brest
Stornoway	+6 38	Greenock
Stromness (Orkneys)	−5 17	Leith
Sunderland	−0 1	N. Shields
Swansea bay	−0 53	Weston-s.-Mare
Tay bar	−0 11	Leith
Tees bar	+0 22	N. Shields
Tenby	−1 12	Weston-s.-Mare
Thurso	−5 49	Leith
Torbay	+0 17	Devonport
Tralee bay	−0 58	Queenstown
Ushant (Ouessant)	−0 15	Brest
Valentia harbour	−1 19	Queenstown
Waterford	+0 19	Queenstown
Westport	−0 4	Queenstown
Wexford	+2 20	Queenstown
Whitby	+0 22	N. Shields
Whitehaven	−0 9	Liverpool
Wick	−2 55	Leith
Wicklow	−0 41	Kingstown
Workington	−0 19	Liverpool
Yarmouth road	−4 43	London
Youghall	+0 13	Queenstown

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MONTHLY ABSTRACT OF NAUTICAL NOTICES.

Note.—The following abbreviations will occasionally be used in the Abstract, as required:

Arch. = Archipelago Chan. = Channel; Cst. = Coast; Harb. = Harbour; Is. = Island; Lt. = Light; Lt.-ho. = Lighthouse; Lt.-ves. = Light-vessel; Pt. = Point.

E. = East; N. = North; S. = South; W. = West.

No.	Place.	Subject.
251	England—S. Cst.—Plymouth Sound	Regulations during torpedo practice.
252	,, ,, Needles Channel	Experimental electric lights.
253	,, ,, ,, S.W. Shingles	Buoy replaced in position.
254	,, Thames Entrance — River Colne—Knowl	Buoy to show occulting gas light.
255	,, E. Cst. — Hartlepool Bay — Longscar	Bell-buoy altered in position.
256	Scotland—E. Cst.—Girdleness	Light altered.
257	Ireland—E. Cst. — Ballygerry Bay — Rosslare	Leading lights still shown.
258	France—N. Cst.—Boulogne Harb.	Alterations in buoyage.
259	,, ,, Cape de la Hague	Light to be altered.
260	North Sea—Belgium—Ostende	Light-buoy and certain harbour lights discontinued.
261	Norway—S. Cst.—Christiansand Fiord—Oxö	Storm signals.
262	,, S.W. Cst.—South Katland	Intended red sector.
263	,, W. Cst.—Græsholmen	Intended red sectors.
264	Baltic Entrance—Kattegat — Nidingen	W. light to have arc of flash.
265	,, ,, ,, Malö	Intended new light.
266	,, ,, Sound — Hven Is. — Kyrkbacken	Sector of red instead of green.
267	,, ,, ,, Konge Deep — Prövesten	New leading lights.
268	,, ,, ,, Copenhagen — Middelgrund	Beacon-vessel and beacons.
269	,, ,, ,, Amager—Dragoi	Additional light.
270	Baltic—Cadet Channel — Giedser Reef Light-vessel	Light and fog-signal to be altered.
271	,, Sweden—Kalmar Sound—Borgholm	Period of exhibition of harbour lights.
272	,, ,, Kläppen	Intended light.
273	,, ,, Lundö	Intended light-buoy.
274	,, Gotland — Westergarn — Skansudde	Intended light.
275	,, G. of Bothnia—Bremö	Temporary discontinuance of fog-signal.
276	,, ,, Askär	Intended leading light.
277	,, ,, Nordalming Fiord —Storbaden and Krikeudde	Intended lights.
278	Mediterranean—Algeria—Port Tenez	W. breakwater damaged; buoy placed.
279	,, Italy—Leghorn	Buoys and lights to mark breakwater.
280	,, ,, Naples Bay — Cavallara Shoal	Light-buoy altered in character.

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MONTHLY ABSTRACT OF NAUTICAL NOTICES—*Continued.*

No.	PLACE.	SUBJECT.
281	MEDITERRANEAN—Adriatic — Brindisi — Pigonati Mole	Additional light.
282	,, ,, Veglia Is. — Verbenico Harb.	Sector of red light.
283	,, Ionian Is.—Santa Maura	Light on mole altered.
284	,, Ionian Sea — Greece — Cerigo Is.—Kapsali Bay	Light re-exhibited.
285	,, Nikaria Is.—Cape Papas	New light.
286	,, Kandeliusa Is. — West End	New light.
287	,, Rhodes Is.—Cape Prasonisi	New light.
288	,, Suez Canal	Draught of water of vessels.
289	BLACK SEA—Kertch Strait	Caution on navigation.
290	RED SEA—N. Musawwa Chan.—Difnein Is.	Amended arc of visibility.
291	AFRICA—East Cst.—Kisimayu Bay—Mark Hill	Non-existence of white column.
292	,, Pemba Is. — Owen Chan. and Port Cockburn	Shoals reported.
293	INDIA—Gulf of Kutch—Mandvi	Harbour light on break-water.
294	,, Alibág Harbour	Amended particulars.
295	,, Palk Strait—Point Calimere	New light.
296	MALACCA STRAIT — Malay Penin.—Dinding Chan.—Pangkor	New harbour lights.
297	CHINA SEA—Malay Penin.—Endau and Rumpen Rivers	New harbour lights.
298	JAVA—N. Cst.—Batavia	Alterations in lights.
299	JAPAN—Kiusiu Is. — Simabara Gulf — Masumi no Seto	Light at N. entrance.
300	AUSTRALIA — Torres Strait—Booby and Gabba Is.	Rock and reef reported.
301	,, ,, ,, Mount Adolphus Is.—Cambridge Point	Dangerous sunken rock.
302	,, Moreton Bay.—Howe or North Chan.—Yellow Patch Lt.	Alteration in position and in the sectors.
303	SOUTH AUSTRALIA—Port Moorowie—Investigator Strait	Buoyage altered.
304	NORTH AMERICA—Vancouver Is.—Ou ou Kinsh Inlet	Rock awash in fairway.
305	SOUTH AMERICA—Brazil—Rio Grande do Sul	Particulars of light.
306	WEST INDIES—Venezuela—Carupano Bay	Light not to be relied on.
307	NOVA SCOTIA	Additional lifeboat stations.
308	NEWFOUNDLAND — Fortune Bay — Grand Bank	Harbour light on breakwater.

NAUTICAL NOTICES.

All Bearings Magnetic, unless otherwise stated.

251.—ENGLAND.—*South Coast.—Plymouth Sound.—Regulations During Whitehead Torpedo Practice.*—As practice with Whitehead fish torpedoes will take place from time to time from the landing

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place in the centre of the north side of the breakwater in Plymouth sound, the line of fire being to the eastward, the following regulations are promulgated for safety of vessels and boats:—(1.) When practice is taking place, a red flag will be hoisted at the flagstaff at the landing place. (2.) When the red flag is hoisted, no craft shall anchor for fishing or other purpose, nor shall any cruising or pleasure sailing take place in the area bounded as follows:—On the north, by an imaginary line drawn from the breakwater fort through the Duke rock buoy to the shore. On the south, by an imaginary line drawn from the east end of the breakwater, to the south extreme of Bovisand fort. Firing will be suspended, and the flag hauled down, during the passage of any vessel using the eastern channel when crossing the area; but when the wind is light, or foul, a sailing craft will be prohibited from passing, if considered necessary to prevent too long suspension of the practice.

252.—ENGLAND.—*South Coast.—Needles Channel. — Intended Experimental Electric Lights.*—The War Department notifies that *electric* lights may be temporarily exhibited from points visible in Needles channel, on any night throughout the month of June and the first half of July, 1890. Guns also may be fired at intervals during this period. The positions of the lights will be as follows:—Warden point; Cliff End, near south part of fort; Cliff End, near north part of fort; West battery, westward of Hurst lights. Mariners are cautioned accordingly.

253.—ENGLAND. — *South Coast. — Needles Channel. — S.W. Shingles Buoy Replaced in Position.*—The S.W. Shingles buoy is now moored in 41 feet at L.W. spring tides, with Needles lighthouse bearing S.E. ¾ E., distant 6$\frac{6}{10}$ths cables, or 1¼ cable E. ½ S. from the charted position previous to the 10th of April. *Variation*, 18° *W.*

254.—ENGLAND.—*Thames Entrances.—River Colne.—Occulting Gas-Buoy at the Knowl Station.*—On or about the 15th June, 1890, the present Knowl buoy, entrance to the river Colne, will be replaced by a buoy showing an *occulting gas light.*

255.—ENGLAND.—*East Coast.—Hartlepool Bay.—Longscar Bell-Buoy.—Alteration in Position.*—With reference to Notice 153,

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p. 336, the Longscar bell-buoy has been replaced near to its former position, and now lies in 4¼ fathoms at L.W. spring tides, with the following marks and bearings, viz. :—The West Blast Furnace on Tod point, just open clear of the Tees South Gare breakwater, S. ½ E.; the lighthouse on the pier at East Hartlepool, N.N.W. ¼ W.; Seaton Low lighthouse, W. by S. ¾ S.

256.—Scotland.—*East Coast.—Girdleness Lighthouse.—Alteration of Light.*—On and after the 30th May, 1890, *one light only* will be shown from Girdleness. It will be a *double group flashing white light*, giving *two flashes* in quick succession *every twenty seconds*. The light, which will be shown from the high lantern, is much more powerful than the former lights, and will be visible all round the sea horizon. The low light is discontinued.

257.—Ireland.—*East Coast.—Ballygerry or South Bay.—Rosslare.—Leading Lights still Exhibited.*—With reference to notice in 1889, on intended discontinuance of the leading lights at Rosslare, Ballygerry or South bay; certain copies of the Admiralty Charts do not show the leading lights at Rosslare, which were reported to be discontinued, but are still exhibited.

258.—France.—*North Coast.—Boulogne Harbour Approach.—Alterations in Buoyage.*—With reference to Notice 57, p. 155, on its having been intended to place an automatic signal-buoy off the extremity of the breakwater (*Carnot*) at Boulogne; by further notice, dated 12th April, 1890, the following alterations have been made in the buoyage, approach to Boulogne harbour :—(1) A buoy, fitted with an automatic whistle, and painted red, is moored about 1¾ cable W. by N. ¼ N., from the northern extremity of the breakwater; (2) the bell-buoy with mirror, and the red buoy with staff and globe, previously moored seaward of the breakwater, have been withdrawn. *Variation*, 16° *W.*

259.—France.—*North Coast.—Cape De La Hague Light.—Intended Alteration in Character, and Exhibition of Provisional Light.*—By notice, dated 28th April, 1890, it is intended to undertake immediately the necessary works for altering the character of the light on Cape de la Hague, to a light with flashes *every ten* *nds.* During the progress of the works, the permanent light will *placed by a provisional fixed white* light of less power, to be

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shown from the gallery of the lighthouse. The provisional light will be obscured by the lantern o the lighthouse through an arc of 90°, or from the bearing of N. 18° E. to N. 72° W. *Variation*, 18° *W.* Further notice will be given as to the exact date of exhibition of the permanent light, prior to which it may be shown experimentally, together with the provisional light.

260.—North Sea.—*Belgian Coast.—Ostende.—Light-Buoy to be Withdrawn, and Harbour Lights Discontinued.*—With reference to notice in 1889, on placing a light-buoy, showing a *fixed* white light, about 33 yards seaward of the old West harbour pier-head at Ostende; and the exhibition of two *red* lights on the East pier; by further notice, the works for the improvement of the fairway channel into Ostende harbour being nearly completed, the light-buoy, with *fixed* white light, off the old West harbour pier-head will shortly be withdrawn; and the two *red* lights (horizontal) on the East pier discontinued.

261.—Norway.—*South Coast.—Christiansand Fiord Entrance.—Storm Signals at Oxö Lighthouse.*—The signals are made on receipt of telegrams from the Meteorological Institute at Christiania. Only day signals are made, with cones and drums, as follows:—*Cone, point down.*—Strong wind from the Southward. *Cone, point up.*—Strong wind from the Northward. *Drum over Cone.*—Very strong wind from the Southward. *Cone (point up) over Drum.*—Very strong wind from the Northward.

Note.—In some harbours in Norway, the receipt of a storm signal is signalised by balls or flags, but there is no uniform system. The warnings are posted as soon as received at the respective harbours.

262.—Norway.—*S.W. Coast.—South Katland Lighthouse.—Intended Sector of Red Light.*—On 1st July, 1890, a sector of *red* light will be shown towards Ullerö Sund from South Katland lighthouse. The sector of *red* light to be shown from South Katland lighthouse will be visible from the bearing of N. 73° W., to the northern limit of the light (S. 86° W.). Vessels therefore keeping in or near the limit indicated by the junction of the *white* and *red* lights will pass between Hestholmboen and Fleskhelleren. Position, lat. 58° 3′ 30″ N., long. 6° 50′ 35″ E. *Variation*, 14° *W.*

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263.—NORWAY. — *West Coast. — Græsholmen Lighthouse. — Intended Sectors of Red Light.*—On 1st August, 1890, two sectors of *red* light will be shown from Græsholmen lighthouse as follows :—The sectors of *red* light to be shown from Græsholmen lighthouse will be visible from the bearing of N. 63° E. to N. 72° E., or over Tekleboerne; and from the bearing of N. 8° W. to N. 43° W., or over Ægholmen and surrrounding shoals. Position, lat. 62° 25′ 45″ N., long. 5° 46′ E. *Variation*, 17° *W.*

264.—BALTIC ENTRANCE.—*The Kattegat.—Nidingen Western Lighthouse—Intended Arc of Flashing Light.*—In the course of the year 1890, *a flashing* white light will be shown through an arc to the south-westward, over Fladen shoal, from Nidingen western lighthouse. Position, lat. 57° 18′ N., long. 11° 54″ E.

265.—BALTIC ENTRANCE.—*The Kattegat.—Swedish Coast.— Intended Light on Malö.*—In the course of the year 1890, a light will be exhibited from a lighthouse to be erected on the south side of Malö island. It will be a *fixed* light, showing *white* over the navigable channels southward and westward; and *red* over Nidingen and Bredaburg shoals, also over the shoal ground to the north-westward. Approximate position, lat. 57° 20′ N., long. 11° 57′ E. Further particulars will be published in due course.

266.—BALTIC ENTRANCE.—*The Sound.—Hven Island.—Kyrkbacken Light.—Sector of Green Light Altered to Red.*—On 23rd April, 1890, the sector of green light hitherto shown from the harbour light at Kyrkbacken would be altered in colour to *red*—so that the light (*fixed*) will show *white* from the bearing of S. 11° E. through South, to S. 79° W.; and *red* from N. 11° W., through East, to S. 11° E. Position, lat. 55° 54′ N., long. 12° 41′ E. *Variation*, 11° *W.*

Note.—This light will be exhibited in future throughout the year.

267.—BALTIC ENTRANCE.—*The Sound.—Approach to Copenhagen. —Konge Deep.—Prövesten.—New Leading Lights, and Discontinuance of Old Leading Lights.*—With reference to notice in 1889, on intended new leading lights, and discontinuance of old leading lights at Pövesten, western side of Konge deep, southern approach

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to Copenhagen; on 15th April, 1890, the new leading lights would be exhibited, and the old leading lights discontinued. Prövesten front light, situated on the north side of the fort, is an *occulting* light of the fourth order, with *one eclipse* of about *two seconds'* duration *every fifteen seconds*, and shows *green* from the bearing of S. 7° W. to S. 13° W., or over the east side of Middelpult; *white* from S. 13° W. to S. 17° W., or over the Fairway; and *red* from S. 17° W. to S. 22° W., or over the west side of Middelgrund. It is elevated 27 feet above the sea, and visible from a distance of about 9 miles. Prövesten rear light, shown from an iron support (48 feet high) on the S.W. angle of the fort, and 147 yards S. 18° W. from the front light, is a *fixed red* light of the fourth order, visible from the bearing of S. 12° W. to S. 24° W. It is elevated 51 feet above the sea, and seen from a distance of 12 miles. Position, lat. 55° 40′ 40″ N., long. 12° 38′ 15″ E. *Variation*, 11° *W.*

Note.—The above mentioned leading lights kept in line, bearing S. 18° W., lead eastward of Torbæk reef in over 4 fathoms water.

268.—Baltic Entrance.—*The Sound.—Copenhagen Approach. —Beacon Vessel and Beacons Marking Site of Intended Fort on the North End of Middelgrund.*—On 24th April, 1890, a beacon vessel (showing the same balls and lights as a wreck-marking vessel) would be moored in the northern approach to Copenhagen, to mark the site of an intended fort, with Tre Kroner lighthouse bearing S. 70° W., distant $2\frac{2}{10}$ths miles, and about 2 cables northward of the bell-buoy (Nördre Tönde) on the N.E. edge of Middelgrund. Also on the following day, the site of the intended fort, extending about $1\frac{9}{10}$ths cable in a north and south direction, as well as east and west, and the centre of which is situated 2 cables S.W. by W. from the beacon vessel, would be marked by five wooden masts, showing 3 feet above the water, and one beacon, showing 6 feet above the water. The masts and beacon are each surmounted by a scaffold, green staff and ball, 12 to 14 feet above the water. The beacon is erected on the southern point of the site. The area within the masts and beacon is closed to navigation. *Variation*, 11° *W.*

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269.—Baltic Entrance.—*The Sound.—Amager.—East Coast.—Dragor.—Additional Light at Rear Leading Lighthouse.*—With reference to notice in 1889, on the intended exhibition of an additional light from the rear leading lighthouse at Dragor, east side of Amager; on 15th April, 1890, the light would be exhibited. Dragor additional light is an *occulting* light of the fourth order, with *one eclipse* of about *half-a-second* duration *every four seconds*, and shows *green* from the bearing of S. 25° W. to S. 32° W., or over the S.E. side of North Röse; *white* from S. 32° W. to S. 40° W., or over the Fairway; and *red* from S. 40° W. to S. 51° W., or over Knollen. It is elevated 22 feet above the sea, and visible from a distance of 9 miles. Position, lat. 55° 35′ 50″ N., long. 12° 40′ 30″ E. *Variation*, 11° *W.*

270.—Baltic.—*Cadet Channel.—Giedser Reef Light-Vessel.—Intended Alteration in Character of Light and Fog-Signal.*—During the month of May, 1890, the following alteration will be made in the character of the light and fog-signal on board Giedser reef light-vessel, western side of Cadet channel. Giedser reef light will be a *flashing white* light, showing *two flashes every half minute*. Position, lat. 54° 28¼′ N., long. 12° 9¾′ E. Also, a siren will be established on board Giedser reef light-vessel, which, during thick or foggy weather, will give two blasts *every two minutes*. Further particulars will be published.

271.—Baltic. — *Swedish Coast.— Kalmar Sound.—Borgholm Harbour Lights.— Period of Exhibition.* — By notice, dated 9th April, 1890, the three *red* harbour lights at Borgholm will be exhibited annually from 1st August to 1st May. Approximate position, lat. 56° 53′ N., long. 16° 39′ E.

272.—Baltic.—*Swedish Coast.—Intended Light on Kläppen.*—In the course of the year 1890, a light will be exhibited from a small iron lighthouse on Kläppen (Storkläppen holm). It will be a *revolving white* light, and bears S. ¼ E., from Tornskars beacon, distant $1\frac{8}{10}$ths mile. Illuminating apparatus will be dioptric, or by lenses of the fifth order. Approximate position on Admiralty Charts, lat. 57° 50′ N,, long. 16° 51′ E. *Variation*, 8° *W.*

273.—Baltic.— *Swedish Coast.— Intended Light-Buoy Northward of Lundö Lighthouse.*—In the course of the year 1890, a

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fixed white light will be exhibited from the red pyramid buoy (Måsskär) eastward of the fairway, northward of Lundö lighthouse. The light will be exhibited annually from 1st April to 15th May, and from 15th July to 15th December. Approximate position, lat. 58° 30′ N., long. 17° 0′ E. Further particulars will be published.

274.—BALTIC. — *Gotland. — Westergarn. — Intended Light on Skansudde.*—In the course of the year 1890, a leading light will be exhibited from a small wooden house on Skansudde, near Westergarn, west coast of Gotland. It will be a *flashing* light, showing *red* over Westergarn Utholme and the adjacent shoal, and *white* over the fairway northward and southward. Illuminating apparatus will be dioptric, or by lenses, of the fifth order. Approximate position, lat. 57° 27′ N., long. 18° 8′ E.

275,—BALTIC. — *Gulf of Bothnia. — Swedish Coast. — Bremö Lighthouse.—Temporary Discontinuance of Fog-Signal.*—In consequence of the fog-horn at Bremö lighthouse being damaged, the fog-signals are discontinued until further notice. Approximate position, lat. 62° 13′ N., long. 17° 45′ E.

276.—BALTIC.—*Gulf of Bothnia.—Swedish Coast.—Intended Light on Askär.*—During the year 1890 a leading light will be exhibited at Askär. It will be a *flashing* light. Position, lat. 63° 18′ 55″ N., long. 19° 9′ 35″ E. Further particulars will be published.

277. — BALTIC. — *Gulf of Bothnia. — Nordalming Fiord.— Intended Lights on Storbaden and Krikeudde.*—During the year 1890 the under-mentioned leading lights will be exhibited on Storbåden, at the entrance to Nordalming fiord, and at Krikeudde, on the eastern shore of the fiord :—(1.) Storbåden light will be an *alternating red and white* light. Position, lat. 63° 24′ 45″ N., long. 19° 35′ 45″ E. (2.) Krikeudde light will be a *flashing* light. Position, lat. 63° 29′ 30″ N., long. 19° 36′ E. Further particulars will be published.

278.—MEDITERRANEAN.—*Algeria.—Port Tenez.—Head of West Breakwater Damaged, Buoy Placed.*—The stone blocks of the West head of the seaward breakwater in construction at port Tenez, which were above water, have been submerged since the gale of

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9th to 10th March. A *conical* buoy, surmounted by a vane, and painted black, has been placed off the west end of the seaward breakwater at port Tenez.

Note.—Vessels entering by the West channel should leave the above-mentioned buoy on the port-hand, and keep in the middle of the channel.

279. — MEDITERRANEAN. — *Italy.* — *West Coast.* — *Leghorn.* — *Breakwater in Progress Marked by a Buoy and Lights.*—With reference to notice in 1889, on the intended construction of a breakwater at Leghorn (Livorno), by further notice, this breakwater is now in course of construction. It will extend 525 yards in a N. 63° W. direction from Vegliaia tower, and on 10th April, 1890, the works would be marked by a buoy and lights, as follows :—An iron *can* buoy, surmounted by a staff and ball (the whole painted red), is moored 547 yards from Vegliaia tower, and in the same line of direction as the works. The breakwater is marked by two sectors of *red* light, shown respectively from the lighthouse on the south extreme of the outer (curved) breakwater ; and from a lantern placed on the terrace of Squarci baths, bearing N. 82° E. from Vegliaia tower, distant about 820 yards. The sector of *red* light shown from the lighthouse on the south extreme of the outer breakwater is visible over the whole extent of the new works, or from the bearing of N. 2° W., through north, to N. 39° E. The light on Squarci baths is a *fixed* light, showing *red* from the bearing of S. 84° E., through north, to the land, and *white* through the remaining arc of the horizon ; it is elevated 23 feet above the sea. Illuminating apparatus dioptric, or by lenses, of the sixth order.

Note.—Vessels entering the port of Leghorn by the South channel should keep within the *white* light shown from the south extreme of the outer breakwater, and with the *white* light of Squarci baths also in sight. *Variation*, 12° *W.*

280.—MEDITERRANEAN.—*Italy.*—*West Coast.*—*Naples Bay.*—*Cavallara Shoal Light-Buoy.*—*Alteration in Character of Light.*—With reference to notice in 1888, on alteration in the character of the light shown from the light-buoy marking Cavallara shoal, western shore of Naples bay ; by further notice the following alteration has

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been made in the character of the light :—Cavallara shoal light is a *flashing red* light, the duration of the flashes being *five seconds*, that of the eclipses *ten seconds*; visible from a distance of five miles. In other respects the character of the buoy is not altered. Approximate position, lat. 40° 47′ N., long. 14° 11′ E.

281.—MEDITERRANEAN.—*Adriatic.—Western Shore.—Brindisi Harbour.—Additional Harbour Light on Pigonati Mole.*—On 20th April, 1890, a harbour light would be exhibited on the inner head of Pigonati mole, eastern side of entrance to Brindisi inner harbour. Pigonati mole inner light, shown from an iron support, is a *fixed red* light, visible from the bearing of S. 28° W., through East, to N. 28° E., elevated 25 feet above the sea, and 21 feet above the ground. It bears S. 56° W. from the fixed green light on the outer head of Pigonati mole, distant 197 yards. *Variation*, 8° *W.*

Note.—Vessels should pass about a quarter of a cable north-westward of Pigonati mole.

282.—MEDITERRANEAN. — *Adriatic. — Eastern Shore. — Veglia Island.—Verbenico Harbour Light.—Sector of Red Light.*—In order to mark the entrance into the port of Verbenico, clear of the submerged portion of the mole in course of construction, a sector of *red* light is shown from the fixed white light on the mole head, visible between the mole head and the coast on the starboard-hand when entering. Vessels therefore, when entering the port, should keep within the sector of *red* light, in order to clear the submerged portion of the mole. Position, lat. 45° 4′ 40″ N., long. 14° 40′ 40″ E.

283.—MEDITERRANEAN.—*Ionian Islands.—Santa Maura.—Santa Maura Mole Light.—Temporary Alteration in Colour.*—On 24th April, 1890, the light, fixed white, on Santa Maura mole head would be temporarily replaced by a fixed *red* light, visible from a distance of 6 miles. Approximate position, lat. 38° 50′ N., long. 20° 43′ E.

284.—MEDITERRANEAN.—*Ionian Sea.—Greece.—Cerigo Island.—Kapsali Bay Light Re-Exhibited.*—With reference to notice in 1889, on the temporary discontinuance of Kapsali bay light, south coast of Cerigo island, pending the establishment of a new illuminating

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apparatus; on 27th April, 1890, the light would be re-exhibited from a new illuminating apparatus. Kapsali bay light is a *fixed red* light, elevated 82 feet above the sea, and visible from a distance of 8 miles. Illuminating apparatus, dioptric, or by lenses, of the sixth order. The light is shown from the old circular lighthouse of masonry (19 feet high), with keeper's dwelling, recently constructed, near it. Position, lat. 36° 8¼′ N., long. 23° 0¼′ E.

285.—MEDITERRANEAN.—*Nikaria Island.—Light on Cape Papas.*—With reference to notice in 1889, on the intended exhibition of a light on cape Papas, S.W. extreme of Nikaria island; on 20th May, 1890, a light will be exhibited from a lighthouse recently erected on the extreme of cape Papas. It will be a *flashing* white light, showing *flashes every minute* with total eclipses. Elevated 213 feet above the sea, and visible from a distance of 25 miles. Approximate position, lat. 37° 30¾′ N., long. 25° 59¾′ E.

286.—MEDITERRANEAN.—*Kandeliusa Island.—Light on West Extreme of Island.*—With reference to notice in 1889, on the intended exhibition of a light on Kandeliusa (Madonna); on 20th May, 1890, a light will be exhibited from a lighthouse recently erected 109 yards within the western extreme of Kandeliusa. It will be a *fixed and flashing* white light, showing *flashes every two minutes;* elevated 180 feet above the sea, and visible from a distance of 18 miles. Approximate position, lat. 36° 29¾′ N., long. 26° 59′ E.

287.—MEDITERRANEAN.—*Rhodes Island.—Light on Cape Prasonisi.*—With reference to notice in 1889, on the intended exhibition of a light on cape Prasonisi, S.W. extreme of Rhodes island; on 20th May, 1890, a light will be exhibited from a lighthouse recently erected 164 yards within the extremity of the cape. Cape Prasonisi light will be a *flashing red and white* light, showing *red and white flashes alternately every thirty seconds*, with total eclipses. Elevated 213 feet above the sea, and visible from a distance of 25 miles. Approximate position, lat. 35° 52¼′ N., long. 27° 47′ E.

288.—MEDITERRANEAN.—*Suez Canal.—Vessels of 25 feet 7 inches draught permitted to pass through.*—As a result of recent improvement in the general depth to nearly 28 feet, the draught of water

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of vessels permitted to pass through Suez canal was, on 15th April, 1890, raised to 7 m. 80 cent., or 25 feet 7 inches.

289.—Black Sea.—*Navigation of Kertch Strait.*—In view of the frequent groundings of vessels passing through Kertch strait, principally on the end of the spit forming the south limit of the channel opposite Kertch fort, and variously known as Kertch spit, Kertch breakwater, and Youjnaia spit; Mariners are reminded that the end of the breakwater or spit is never visible, but is for the length of nearly a mile from its extremity covered with water; and also that the bank stretching off Ak Bouroun is similarly invisible. The currents are capricious, and mainly dependent on the winds, and great care is necessary in the navigation of the strait generally.

290.—North Musawwa Channel.—*Difnein Island.—Amended Arc of Visibility.*—With reference to Notice 111, p. 247, and previous notice, on the exhibition of a light on Difnein island, eastern side of entrance to North Musawwa channel; by further notice the arc of visibility of the light is as undermentioned, not as previously stated:—Difnein island light, *fixed white*, is visible over an arc of 195°, or from the bearing of N. 54° E., through south, to S. 69° W. Position, lat. 16° 37′ N., long. 39° 19′ E. *Variation*, 4° *W.*

291.—Africa.—*East Coast.—Kisimayu Bay.—Mark Hill.—Non-Existence of White Column.*—The white column on the N.E. side of Mark hill, which in line with Pillar rock formed a leading mark through Inner pass, Kisimayu (Refuge) bay, does not exist.

Note.—A light coloured pillar is situated on the S.W. side of Mark hill, which, if mistaken for the white column and brought in line with Pillar rock, would bring a vessel into danger, as it leads only three-quarters of a cable S.W. of Fawatu island.

Caution.—In entering any of the passes into Kisimayu bay, due regard must be paid to the current, which sets along the coast; strength varying with the monsoon.

292.—Africa.—*East Coast.—Pemba Island.—West Coast.—*(1.) *Owen Channel.—Shoal Northward of Fairway.*—Captain W. H. Henderson, H.M.S. *Conquest*, reports the existence of a shoal lying northward of the fairway in Owen channel, west coast of

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Pemba island. The shoal in Owen channel, of small extent, with a depth of 1¼ fathom on it, and 6 to 7 fathoms close around, lies with—S.E. extreme of Mapanya, N. by E., distant 1 7/10ths mile; North extreme of Mkumbuu peninsula, S.E. by E. ¾ E.

(2.) *Shoal in Port Cockburn.*—Also, the existence of a shoal in the bay S.E. of Pembe island, port Cockburn. The shoal S.E. of Pembe island, of small extent, with a depth of 5 fathoms, and 7 to 9 fathoms around, lies with—South extreme of Funzi, W. ⅛ N.; East extreme of Pembe island, N. by W. ¼ W., distant 7 cables.

Note.—As the survey on which the plan of these harbours is based was broken off by the ship being ordered elsewhere, before it was completed, it is very possible that other unknown small dangers may exist. The depths given are at L.W. spring tides. *Variation*, 9° *W.*

293. — India. —*West Coast.* — *Gulf of Kutch.* — *Mandvi.* — *Harbour Light on Breakwater.*—On 1st April, 1890, a harbour light would be exhibited at the end of the breakwater at Mandvi, northern shore of gulf of Kutch. Mandvi breakwater light is a fixed *red* light, elevated 24 feet above H.W. Illuminating apparatus, dioptric, or by lenses, of the sixth order. Position, lat. 22° 49¼′ N., long. 69° 20¼′ E.

294.—India.—*West Coast.*—*Alibág Harbour Light.*—*Amended Particulars.*—With reference to Notice 227, p. 437, on the exhibition of a harbour-light on Alibág fort signal station; the following amended particulars of the light have been published. Alibág light, *fixed green*, is visible from the bearing of E.N.E., through north, to N.N.W., elevated 32 feet above the sea, and should be seen from a distance of 8 miles. Approximate position, lat. 18° 38′ N., long. 72° 51′ E. *Variation*, 1° *E.*

Note.—This light is for the benefit of fishing boats and coasting craft making for Alibág road. Any vessel not bound for Alibág, sighting this light, is in danger, and should stand off shore at once, or anchor and await daylight.

295.—India.—*Palk Strait.*—*Northern Shore.*—*Light on Point Calimere.*—On or about 1st May, 1890, a light would be exhibited from a steel mast (about 45 feet high) erected on point Calimere,

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north entrance point to Palk strait. Point Calimere light is a fixed *pale red* light, elevated about 55 feet above H.W., and visible from a distance of 6 miles. Illuminating apparatus, dioptric, or by lenses, of the sixth order. Approximate position on Admiralty charts, lat. 10° 18′ N., long. 79° 51¼′ E.

296.—Malacca Strait.—*Malay Peninsula.—Dinding Channel. —Western Shore.—Harbour Lights Southward of Pangkor.*—On 1st January, 1890, the two undermentioned harbour lights would be exhibited southward of Pangkor, western shore of Dinding channel:—(1.) A *fixed red* light is shown from a stone beacon on the rock (*Hospital rock*), situated 2¾ cables S.E. ⅝ S. from the observation spot at Pangkor. Position, lat. 4° 13′ 5″ N., long. 100° 34′ 15″ E. *Variation*, 2° *E.* (2.) A *fixed white* light is shown from the jetty head, situated about three-quarters of a cable S.W. by S. from Hospital rock.

297.—China Sea.—*Malay Peninsula.—East Coast.*—(1.) *Endau River.—Harbour Light at Entrance.*—A harbour-light is now exhibited from a pole on the northern side of Endau (Indau) river entrance. It is a *fixed white* light, elevated 40 feet above the ground, and visible from a distance of about 6 miles. Approximate position, lat. 2° 40′ N., long. 103° 37′ E.

(2.) *Rumpen River.—Harbour Light at Entrance.*—Also, a harbour light is now exhibited from a pole on the northern side of Rumpen (Rompin) river entrance. It is a *fixed red* light, elevated 40 feet above the ground, and visible from a distance of about 5 miles. Approximate position, lat. 2° 46′ N., long. 103° 30′ E.

298.—Java.—*North Coast.—Batavia, Western Approach.— Alterations in Lights.*—With reference to Notice 172, p. 341, and previous notices on alterations in certain lights, Western approach to Batavia; on 1st March, 1890, lights were exhibited on Babi and Payung islands.

(1.) A light, shown from the South extreme of Babi island, is a *fixed* white light of the fifth order, visible from the bearing of S. 81° E., through North, to N. 88° W.; it is elevated 60 feet above H.W., and seen from a distance of 13 miles. The light-house, 64 feet high, is constructed of iron framework, and painted white; the keeper's dwelling near, is white with red roof.

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Approximate position, lat. 5° 49′ S., long. 106° 17′ E. *Variation*, 2° *E.*

(2.) A light, shown from the South extreme of Payung island, is a *fixed* white light of the fifth order, elevated 61 feet above H.W., and visible in clear weather from a distance of 13 miles. The lighthouse, 65 feet high, is constructed of iron framework and painted white; the keeper's dwelling near, is white with red roof. Approximate position, lat. 5° 49½′ S., long. 106° 33′ E. On the exhibition of the above lights on Babi and Payung islands, the lights (*fixed* white) on Merak and Great Kombuis islands were discontinued, and the lighthouses would soon be pulled down. Position of Merak island lighthouse, lat. 5° 56½′ S., long. 105° 58½′ E. Position of Great Kombuis lighthouse, 5° 55½′ S., long 106° 34½′ E.

299.—JAPAN.—*Kiusiu Island.—West Coast.—Simabara Gulf.—Light at Masumi no Seto Northern Entrance.*—On 1st March, 1889, a light would be exhibited from a lighthouse recently erected on the west side of the northern entrance to Masumi no Seto, south-eastern shore of Simabara gulf. The light at Masumi no Seto northern entrance is a *fixed white* light, visible through an arc of 148°, or from the bearing of S. 74° E. to S. 74° W.; it is elevated 129 feet above the sea, and seen from a distance of 6 miles. The lighthouse, 14 feet high, constructed of wood, and square in shape, is painted white. Position, approximate, on Admiralty Chart, lat. 32° 37½′ N., long. 130° 29′ E. *Variation*, 4° *W.*

300.—AUSTRALIA. — *North Coast. — Torres Strait Approach.*—(1.) *Sunken Rock Reported Westward of Booby Island.*—Messrs. Sinclair and Anderson, employed in obtaining pearl shell, have reported the existence of a sunken rock, with about 18 feet on it at L.W., lying with Booby island bearing E. by S., distant about 15 miles. Approximate position, lat. 10° 32½′ S., long. 141° 40′ E.

(2.) *Reef Reported North-Eastward of Gabba Island.*—Also, on the same authority, a reef lies about 2 miles north-eastward of Gabba (Brothers Hills) island. This reef is stated to lie with the S.E. point of Gabba island bearing S.W. ½ S., and the N.W. point W. by S. Approximate position, lat. 9° 44½′ S., long. 142° 41′ E. *Variation*, 5° *W.*

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301.—Australia.—*North Coast.—Torres Strait.—Mount Adolphus Island. — Dangerous Sunken Rock Southward of Cambridge Point.*—Report of the existence of a dangerous sunken rock lying near the "course recommended" between Cape York and Mount Adolphus island Torres strait. This rock (*Quetta rock*), on which the British steamship *Quetta* struck in February, 1890, afterwards foundering, has a depth on it not exceeding 16 feet at L.W., and lies with Cambridge point S.W. extreme of Mount Adolphus island, bearing N. by E. ½ E., Nly., distant 9 cables. Position, lat. 10° 40′ 5″ S., long. 142° 38′ 15″ E. *Variation*, 5° *E.*

302. — Australia.—*East Coast. — Moreton Bay. — Howe or North Channel.—Yellow Patch Light.—Alteration in Position and in the Sectors of White Light.*—With reference to Notice 237, p. 440, and previous notice, relating to Howe or North channel; by further notice the illuminating apparatus of Yellow Patch light has been shifted to a light-room E.N.E. of the old lighthouse, and when in line with cape Moreton light bears E. by S. ½ S. southerly. This line of direction intersects that of Tangaluma and Cowan Cowan lights in line at the northernmost point at which that leading mark should be used. The southern limit of the inner *white* sector of Yellow Patch light is on an E. ½ S. bearing, as formerly. Vessels when northward of this southern limit must keep Tangaluma light slightly open westward of Cowan Cowan light, and should not get westward of the leading mark of Tangaluma and Cowan Cowan lights in line while within the distance of one mile southward of the limit. With the lights in line, the depth abreast East bank does not now exceed 17 feet at L.W. The outer *white* sector of Yellow Patch light is obscured by the land eastward of the bearing S. ½ E. The inner limit of the *red* sector of Yellow Patch light leads northward of the floating beacon north of East bank as formerly. *Variation*, 9° *E.*

303.—South Australia.—*Port Moorowie, Investigator Strait.—Buoyage.*—The red and black perch buoys have been removed from port Moorowie, but the chequered buoy which marks the shoal patch south of the jetty remains in its original position.

304.—North America.—*West Coast.—Vancouver Island.—West*

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Coast.—Ou Ou Kinsh Inlet.—Rock Awash in Fairway of Approach. —With reference to Notice 183, p. 345, on the reported existence of a rock lying in the fairway of approach to Ou ou Kinsh inlet from the south-westward, west coast of Vancouver island, the late master of the schooner *Juanita* reports that the rock is awash at L.W., instead of at H.W., as previously stated. A rock, awash at L.W., in the approach to Ou ou Kinsh inlet from the south-westward, lies with Clara islet bearing N.E., distant 1¼ mile, and the outermost (south-western) islet of the Barrier islands E. by S. Position, lat. 50° 3′ 40″ N., long. 127° 39′ 25″ W.

Note.—The leading mark heretofore given (entrance of Ou ou Kinsh inlet open, bearing N.N.E. Nly., leads 1¼ mile eastward of Sulivan reefs) is no longer available. *Variation*, 24° *E.*

305.—South America.—*Brazil.—Rio Grande Do Sul.—Particulars of Light.*—With reference to notice in 1887, on the exhibition of a provisional light—during alterations in the permanent light, exhibited subsequently—from the lighthouse on the eastern side of entrance to Rio Grande do Sul, the following particulars concerning the permanent light have been received :— Rio Grande do Sul light shows a *fixed white* light for *thirty seconds*, then *one flash* and a short eclipse *every six seconds* in the *next thirty seconds*, thus completing the revolution in *one minute*. It is elevated 104 feet above H.W., and visible from a distance of about 16 miles. Illuminating apparatus, dioptric, or by lenses, of the second order. The lighthouse, about 114 feet high, is painted a light red colour. Position, lat. 32° 7¼′ S., long. 52° 7¼′ W.

Note.—Approaching Rio Grande do Sul entrance, the lead should always be used, especially during hazy weather.

306.—West Indies.—*Venezuela.—Carupano Bay.—Exhibition of Light not to be Relied on.*—With reference to notice in 1887, on the exhibition of a light from the old lighthouse on the northern side of Carupano Bay ; on the authority of the Commander of the General Transatlantic Company's steam-vessel *Labrador*, the exhibition of Carupano bay light cannot be relied on. Position, lat. 10° 41′ N., long. 63° 15′ W.

307.—Nova Scotia.—*Additional Lifeboat Stations.*—During the past year lifeboats have been placed at the following stations on

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the coasts of Nova Scotia, and are held ready for service in case of disasters to shipping:—

(1.) A lifeboat station is established on the eastern end of Pictou island, Northumberland strait. Position, approximate, lat. 45° 49′ N., long. 62° 30′ W.

(2.) A lifeboat station is established on the N.W. end of Mouton island, port Mouton entrance, S.E. coast of Nova Scotia, with Spectacle island lighthouse bearing N.W. by W., distant $1\frac{1}{10}$th mile. Position, approximate, lat. 43° 55′ N., long. 64° 47′ W.

(3.) A lifeboat station is established at Blanche, western entrance to Negro harbour, S.E. coast of Nova Scotia. Position, approximate, lat. 43° 30′ N., long. 65° 24′ W. *Variation*, 20° *W.*

808.—Newfoundland.—*South Coast.—Fortune Bay.—Grand Bank.—Harbour Light on Breakwater.*—On 1st May, 1890, a harbour light would be exhibited from a wooden beacon erected 100 yards in a W.N.W. direction from the extremity of the breakwater at Grand Bank, south shore of Fortune bay. Grand Bank light is a *fixed white* light, visible from the bearing of S.E. by S., through south, to west; elevated 24 feet above H.W., and should be seen from a distance of about 5 miles. Illuminating apparatus, dioptric, or by lenses, of the eighth order. The beacon, 23 ft. high, is painted red and white in alternate horizontal bands. Approximate position on Admiralty Charts, lat. 47° 6′ N., long. 55° 45½′ W. *Variation*, 29° *W.*

Wrecks Reported in Positions Dangerous to Shipping.

7.—North Sea.—*Floating Wreck on Eastern Part of Dogger Bank.*—The master of the lugger *Vlissengen 94* has reported having passed, on 10th April, in a position dangerous to shipping, a wreck drifting with forepart sunk in about 11 fathoms water, and afterpart awash, on the eastern part of the Dogger bank, in lat. 54° 45′ N., long. 2° 50′ E. The rigging of the wreck was floating alongside. The name could not be made out owing to the high sea, but the letters S N were visible.

8.—North Sea.—*Floating Wreck Eastward of Tynemouth.*—The master of the fishing-boat *Progress* has reported having passed, on 21st April, in a position dangerous to shipping, a vessel floating

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bottom up, without a rudder, about 56 miles E. ¼ N. from Tynemouth. Position, approximate, lat. 55° 25′ N., long. 0° 0′. *Variation*, 19° *W.* (This has since been dispersed by the Trinity House Authorities.)

9.—North Sea.—*Sunken Wreck North-Westward of the Texel.*—The commander of the German steam-vessel *Hanover*, has reported having passed, on 11th April, 1890, in a position dangerous to shipping, the mast of a vessel showing above water, with Kykduin lighthouse bearing S. 53° E., distant 14 miles. Approximate position, lat. 53° 2½′ N., long. 4° 22′ E., in a depth of about 16 fathoms at L.W. *Variation*, 15° *W.*

10.—Gulf of Aden.—*Northern Shore.—Aden Anchorage.—Lights Marking Wreck.*—From 1st June to 15th September, the three *white* lights placed triangularly on the foremast, and single *white* light on the mizenmast, of the steam-vessel *Anadyr* sunk in Aden anchorage, will be temporarily replaced by three *white* lights, triangularly placed, and shown from a boat moored half-a-cable southward of the wreck. The wreck lies approximately with the light-vessel bearing N. 87° E., distant 9 cables, and Ras Tarshein, S. 53° E. Vessels entering or leaving the anchorage should pass southward of the wreck. *Variation*, 4° *W.*

From the *Pilot Chart of the North Atlantic for May*, it appears that during April the principal feature was the very unusual easterly movement of ice, so that in addition to the large number of bergs south of the tail of the Banks, almost to the 41st parallel, bergs are constantly reported almost as far east as the 35th meridian, in lat. 46° and 47° N. It is stated that there have already been twenty serious accidents, two vessels having been lost and many others damaged and delayed. The quantity of ice is said to be enormous, one vessel reporting 140 bergs, others 59, 50, 49, &c., while in size some of them are 250 ft. high and 1,000 ft. long. Attention is also called to the fact that the Chamber of Commerce of Bordeaux has offered a series of prizes in order to induce masters and officers of vessels to make thorough trial of the use of oil at sea, especially as regards the best way to use it and the practical benefits to be derived from such use. The competition is understood to be open to all nationalities.

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OUR OFFICIAL LOG.

CHARTS WHOLLY OR PARTIALLY RE-DRAWN.

Board of Trade, Marine Department,

May 17th, 1890.

THE following Admiralty Charts have recently been newly issued, or so largely corrected as to render a new Chart desirable. The date of the alteration is notified in the centre of the bottom of the Chart.

NOTE.—Charts that have received such alterations as can usually be made by hand on the Charts in use, in agreement with the "Notices to Mariners," are not described in the List below. The date of such alteration is shown at the left-hand lower corner of the Chart.

Chart No.	Title of Chart.	Nature and Subject of Correction.
2593	North Sea: Ameland to Jade River	River Ems. March.
2300	Gulf of Bothnia: Sheet V. ...	Numerous corrections throughout. April.
644	Africa, E.: Delagoa Bay ...	Slip added at top. April.
219	Sumatra, N.: Acheen Head to Diamond Point	Extensive corrections to coast, and plans Balkan and Sund Bays, Krang Raja Bay, and Saban Bay. April.
1117	Russian Tartary and Saghalin Island: Anchorages... ...	Plan, New Djigit Bay, large corrections. April.
2763	Australia: Coral Sea and Great Barrier Reefs...	N. of New Caledonia, Grand Passage and surrounding reefs. April.
1380	New Caledonia: New Hebrides and Loyalty Islands... ...	N. of New Caledonia, Grand Passage and surrounding reefs. April.
1190	England, E.: Blakeney to Flamborough Head	New Chart. May.
1598	English Channel	Numerous additional soundings. May.
1123	South Coast of Ireland to Land's End	Numerous additional soundings. May.
1121	Norway, W.: Bergen	Pudde Fiord. May.
790	The Sound: Approaches to Copenhagen	Sectors of Lights and general corrections. April.
2252	Gulf of Bothnia	General correction throughout. May.
1320	Spain, S.E.: Cape San Antonio to Cape Tortosa	New Chart. April.
1556	Greece, E.: Gulf of Volo, with Oreas and Talanta Channels	New Chart. May.

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Chart No.	Title of Chart.	Nature and Subject of Correction.
1085	Archipelago: Negropont to Gulf of Kassandra, including Gulf of Saloniki	New Chart. March.
1199	China, E.: Kweshan Island to Yang-tse-Kiang, and Chusan Archipelago	Islands eastward of Keu-shan, and sketch of leading marks. March.
1030	Australia, E.: Great Sandy Strait, southern portion ...	Corrections to leading marks in Inner Channels. March.
214	Solomon Islands	Malaita and Vella Lavella Islands. April.
2421	Tonga or Friendly Islands ...	Tongatábu group to Polorus reef. March.

Agent for the sale of Admiralty Charts, Mr. J. D. Potter, 31, *Poultry, London, E.C.*

Official Return of British Wrecks in April, 1890.—The number and tonnage of British vessels respecting whose loss reports were received at the Board of Trade during the month of April, 1890, and the number of lives lost, are as follows:—

Description.	Number.	Tonnage.	Lives Lost.
Sailing	39	4,992	18
Steam	17	9,934	62
Total	56	14,926	80

The above table is a record of "reports received" in the month, and not of wrecks which occurred during the month. Many of the reports received in April relate to casualties which occurred in previous months. Casualties not resulting in total loss of vessels, and the lives lost by such casualties, are not included.—George J. Swanston, Assistant-Secretary, Marine Department.—Board of Trade, 1st May, 1890.

The Board of Trade have determined to postpone till the 1st day of November next the operation of the rules made under the Merchant Shipping (Life Saving Appliances) Act, 1888, which were to have come into force on the 30th June.

The Board of Trade have awarded binocular glasses to Mr. Louis Champel, master of the French fishing-boat *Courbet*, of Croisic, and to Mr. Joseph Provost, master of the French light-

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house tender *Avel*, in recognition of their services in rescuing the crew and passengers of the s.s. *Lady Ailsa*, of London, which was wrecked on La Four Reef on the 22nd February last.

The Board of Trade have awarded a binocular glass to Mr. R. Ferroni, master of the Italian s.s. *Taormina*, in acknowledgment of his humanity and kindness to the shipwrecked crew of the s.s. *Helmsted*, of Hartlepool, which foundered at sea on the 22nd March last.

Official Inquiries at Home, 1890.

4030. *Florence Richards*, s.s.; built at Sunderland, 1874; owned by Mr. C. Nicholson and others; tonnage, 668; Arzu to Rouen; salt; struck some obstruction off Cape Roca, Portugal, and foundered, when one life was lost, March 10, 1890. Inquiry held at Liverpool, April 10, 1890, before Raffles, Judge; Parish, Richardson, and Dyer, N.A. Court not prepared to say upon what the vessel struck.

4031. *Cræsus*, s.s.; built at Sunderland, 1882; owned by Mr. T. Kish and others; tonnage, 762; Neder Kalix to Rouen; deals; stranded on Bjuröklubb Reef, Gulf of Bothnia, October 1, 1889. Inquiry held at Newcastle, April 10, 1890, before Nelson and Gibson, Justices; Castle and French, N.A. Stranding caused by master and mates not seeing that the intended courses were properly made, and by the neglect of the lead. Certificate of former suspended for three months; latter reprimanded.

4034. *Abbey Town*, barque; built at Port Glasgow, 1875; owned by Mr. J. Barker and others; tonnage, 702; Pisagua to Dunkerque; nitrate; stranded near Calais, March 9, 1890, and further damaged by fire the following day. Inquiry held at Liverpool, April 21, 1890, before Raffles, Judge; Davies and Richardson, N.A. Stranding owing to master having stood in too long towards the land without knowing his exact position. Certificate suspended for three months. No proof as to cause of fire.

4039. *Navarra*, s.s.; built at Port Glasgow, 1882; owned by Mr. H. Lamont and others; tonnage, 418; Ayr to Ardrossan;

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ballast; stranded on Black Rock, April 1, 1890. Inquiry held at Troon, April 23, 1890, before Cowan and Wood, Justices; French and Bragg, N.A. Stranding owing to the improper courses set, the neglect of the lead, and bad look-out. Certificate of master suspended for six months.

4040. *Eshcol*, s.s.; built at Sunderland, 1875; owned by Mr. J. F. Middleton; tonnage, 952; Smyrna to Leith; barley; abandoned off Corunna, March 19, 1890. Inquiry held at North Shields, April 26, 1890, before Stevenson and Jackson, Justices; Castle and Brooks, N.A. Abandonment owing to cargo shifting. Master censured for non-compliance with Regulations relating to feeders.

4041. *Primate*, s.s.; built at Middlesbrough, 1883; owned by Primate Steamship Company, Limited; tonnage, 1,187; Middlesbrough to Rotterdam; pig-iron; stranded near Goeree Lighthouse, Holland, March 26, 1890. Inquiry held at Middlesbrough, April 25, 1890, before Coleman, Judge; Anderson and Baker, N.A. Stranding due to master mistaking Goeree light for a fishing-boat's light, and neglecting the lead. Certificate suspended for three months.

4042. *Lady Ailsa*, s.s.; built at Troon, 1888; owned by Messrs. Wyllie; tonnage, 765; Troon to St. Nazaire; coal and iron; stranded on Du Four Reef, near St. Nazaire, February 22, 1890. Inquiry held at Glasgow, April 22, 1890, before Lees, Judge; Hore and Bain, N.A. Stranding owing to error of judgment of master in mistaking Du Four Reef Buoy for the buoy off Pilier Lighthouse. He was navigating by a general chart which did not show all the buoys.

4044. *Isle of Bute*, barque; built at Port Glasgow, 1875; owned by Mr. J. Bushby and others; tonnage, 929; Liverpool to Iquique; coal; not heard of since sailing, July 4, 1889. Inquiry held at Liverpool, April 30, 1890, before Raffles, Judge; Castle and Wilson, N.A. No clue to her loss. Vessel thoroughly cleaned from her last cargo of nitrate.

4046. *Rohilla*, ship; built at Port Glasgow, 1885; owned by Mr. J. B. Foley and others; tonnage, 1,598; Falmouth to Hamburg; nitrate; lost with all hands off Dutch coast,

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January 26, 1890. Inquiry held at Westminster, May 1, 1890, before Marsham, Judge; Methven and Kiddle, N.A. Vessel foundered through striking a shoal in the neighbourhood of the Texel. She was three hands short of her usual crew of twenty-nine.

4047. *Virent*, s.s.; built at Sunderland, 1880; owned by Mr. J. Westoll and others; tonnage, 1,085; Sulina to Liverpool; wheat; abandoned off Ferrol, Spain, and nine lives were lost, March 21, 1890. Inquiry held at Sunderland, May 3, 1890, before Stokoe and Potts, Justices; Powell, Ward, and Lang. Abandonment primarily caused by the breaking of the tail-end of the propeller-shaft.

4048. *Ethel Gwendoline*, s.s.; built at Newport, 1883; owned by Mr. R. Taylor; tonnage, 155; Sunderland to Inverness; coal; foundered off Fraserburg, March 21, 1890, when 7 lives were lost. Inquiry held at Sunderland, May 5, 1890, before Potts and Pecket, Justices; Powell, Ward, and Lang, N.A. Loss caused by stress of weather whereby heavy seas were shipped on board, which washed away the fore-hatch tarpaulin and entered the hold.

4049. *Benamain*, s.s.; built at Aberdeen, 1878; owned by Mr. J. T. Harrison; tonnage, 246; Swansea to Treport; coal, tin and iron; stranded on Lundy Island, March 29, 1890. Inquiry held at Westminster, May 3, 1890, before Marsham, Judge; Ronaldson and Parfitt, N.A. Stranding owing to master shaping a course without making proper allowance for tide; and to mate not keeping a good look-out. Certificate of former suspended for six months; latter censured. Vessel undermanned with but three A.B.'s.

4050. *Clydesdale*, s.s.; built at Port Glasgow, 1881; owned by Messrs. MacKill and others; tonnage, 608; Glasgow to Bilbao; coal; stranded near South Bishop's Light, St. George's Channel, March 28, 1890. Inquiry held at Glasgow, April 24, 1890, before Lees, Judge; Hore and Bain, N.A. Stranding due to master continuing too long on his course without taking proper precautions in foggy weather to verify it. Certificate suspended for three months; recommended for one as mate.

4051. *Mary Ann Hood*, fishing smack, and *Ottawa*, s.s.; former built at Grimsby, 1885; owned by Messrs. Dunlin; tonnage, 86;

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Grimsby to Dogger Bank; latter built at Sunderland, 1873; owned by Mr. J. H. W. Culliford and others; tonnage, 831; Bilbao to Newcastle; iron ore; in collision off Flamborough, March 15, 1890, when former sank. Inquiry held at Hull, May 3, 1890, before Twiss, Judge; Cosens and Richardson, N.A. Collision, which took place in broad daylight, due to negligent navigation of second mate of *Ottawa*. Certificate suspended for six months. Master also failed to stand by the smack after collision. Certificate suspended for three months.

Fishery Inquiry, 1890.

S. 38. *Star of Bethlehem*, dandy; built at Grimsby, 1883; owned by Mr. A. Doust; tonnage, 78; Great Fisher Bank to Grimsby; stranded near Staithes, when thought to be on the Dogger Bank, February 15, 1890. Inquiry held at Hull, April 16, 1890, before Twiss, Judge; Wilson and French, N.A. Casualty owing to skipper wrongly estimating his point of departure from the fishing ground, to the insufficient use of the lead, and to the bad look out. Certificate suspended for four months.

Official Inquiries Abroad, 1890.

4028. *Ida Hilton*, schooner; capsized between South West Reef and High Cay, Bahamas, when four lives were lost, February 4, 1890. Inquiry held at New Providence, February 17, 1890. Loss occasioned by a heavy storm.

4029. *Blythswood*, ship; stranded near Mouille Point Lighthouse, February 28, 1890. Inquiry held at Cape Town, March 15, 1890. Casualty owing to master navigating too close to the coast. Certificate suspended for six months.

4032. *South Glen*, barque; stranded off Pena Planca Point, 32° 25′ S., 71° 43′ W., February 20, 1890. Inquiry held at Valparaiso, February 28, 1890. Stranding owing to wind falling light, and to the swell and current setting vessel ashore. Master censured for not attempting to anchor.

4033. *Holt Hill*, barque; stranded on St. Paul's Island, November 18, 1889, when the mate was drowned. Inquiry held

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at Port Adelaide, January 13, 1890. Casualty owing to master carrying a heavy press of sail when in the vicinity of land at night although he had been unable to obtain sights for three days, and to a look-out not having been kept from aloft. Certificate suspended for three months.

4035. *Lucia*, barque; damaged at Fremantle, February 21, 1890. Inquiry held at Fremantle, March 11, 1890. Vessel probably struck her own anchor, or that of another vessel, when being brought in to the jetty in charge of a pilot.

4036. *Balmore*, barque; stranded on Mocha Island, January 16, 1890. Inquiry held at Valparaiso, March 12, 1890. Loss owing to an error in the chronometer.

4037. *Ayacucho*, s.s.; starboard superheater exploded and five lives were lost, off Gorda Point, February 24, 1890. Inquiry held at Valparaiso, March 17, 1890. Casualty owing to the corrosion of the plates in the superheater, and to the excessive steam pressure of sixty pounds. Owners ordered to pay costs, $912 76 c.

4038. *Maria*, schooner; stranded on Sandringham Reefs, Gabriel Island, February 14, 1890. Inquiry held at Mauritius, March 18, 1890. Casualty due to the uncertificated master leaving the navigation at the most critical part of the voyage to his incapable mate.

4043. *Rugby*, s.s., and *Glucksburg*, German s.s.; in collision in Rangoon River, February 21, 1890. Inquiry held at Rangoon, March 31, 1890. Collision owing to pilot of *Glucksburg* not keeping starboard shore on board.

4045. *Inventor*, s.s., and *Rescue*, s.s.; in collision in Noorpoor Reach, February 13, 1890. Inquiry held in India, March 11, 1890. Collision due to *Inventor* accidentally taking a sudden sheer.

4052. *Holyhead*, ship; stranded on Point Lonsdale Reef, Port Phillip Heads, February 12, 1890. Inquiry held at Melbourne, February 27, 1890. Stranding due to gross misconduct of master and mate in carelessly navigating the vessel. Certificates suspended for two years and eighteen months respectively. Master also ordered to pay £20 and the mate £10 towards costs.

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NAUTICAL GOSSIP AT HOME AND ABROAD.

A Bill is being promoted by the Manchester Ship Canal Company to authorise them to substitute fewer tidal openings into the Mersey than were fixed by the Act of 1885—the total width of the openings to be reduced from 4,500 ft. to 1,800 ft. The Mersey Dock and Harbour Board oppose the Bill, on the ground of injury to the estuary owing to diminished flow; and the same ground is taken by the Widnes Corporation and the London and North-Western Railway Company.

Messrs. Ramage and Ferguson, Leith, have secured an order to build a 850-ton steel steam-yacht for Mr. Harry Taylor, late owner of the well-known schooners *Bluebell* and *Hildegarde*. The vessel will be fitted with triple-expansion engines, having cylinders 15½ ins., 25 ins., and 40 ins., diam. 27 in. stroke. The same builders are also laying down a steam-yacht of 600 tons.

It is only such odd orders that are now being placed with shipbuilders—although some mercantile steamers are being contracted for. West Hartlepool shipbuilding and engineering establishments have recently booked two orders, and Sir Raylton Dixon & Co., Middlesbrough, have also been fortunate in securing additional contracts. Mr. James Laing, of Sunderland, also recently contracted to build a steamer, duplicate of the late *Umbolozi*, for the owners, Messrs. Bullard, King & Co., London. It is rumoured that the Cunard Company have given out an order for a 9,000-ton steamer, to be built on the Clyde.

Despite the additional work here indicated, gradually slackness is becoming the feature of the shipbuilding and engineering industries. Ordinary mercantile tonnage has already depreciated about 20 per cent. in the last six months, and if "overbuilding" was continued much longer, a still greater fall in values would be witnessed.

Great complaints are being made by shipowners about the depth of water over the dock sills at Liverpool. The *Majestic*

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NAUTICAL GOSSIP AT HOME AND ABROAD.

A Bill is being promoted by the Manchester Ship Canal Company to authorise them to substitute fewer tidal openings into the Mersey than were fixed by the Act of 1885—the total width of the openings to be reduced from 4,500 ft. to 1,800 ft. The Mersey Dock and Harbour Board oppose the Bill, on the ground of injury to the estuary owing to diminished flow; and the same ground is taken by the Widnes Corporation and the London and North-Western Railway Company.

Messrs. Ramage and Ferguson, Leith, have secured an order to build a 350-ton steel steam-yacht for Mr. Harry Taylor, late owner of the well-known schooners *Bluebell* and *Hildegarde*. The vessel will be fitted with triple-expansion engines, having cylinders 15½ ins., 25 ins., and 40 ins., diam. 27 in. stroke. The same builders are also laying down a steam-yacht of 600 tons.

It is only such odd orders that are now being placed with shipbuilders—although some mercantile steamers are being contracted for. West Hartlepool shipbuilding and engineering establishments have recently booked two orders, and Sir Raylton Dixon & Co., Middlesbrough, have also been fortunate in securing additional contracts. Mr. James Laing, of Sunderland, also recently contracted to build a steamer, duplicate of the late *Umbolozi*, for the owners, Messrs. Bullard, King & Co., London. It is rumoured that the Cunard Company have given out an order for a 9,000-ton steamer, to be built on the Clyde.

Despite the additional work here indicated, gradually slackness is becoming the feature of the shipbuilding and engineering industries. Ordinary mercantile tonnage has already depreciated about 20 per cent. in the last six months, and if "overbuilding" was continued much longer, a still greater fall in values would be witnessed.

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